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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648-XG909

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to Site Characterization Surveys of Lease Areas.

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice; issuance of an incidental harassment authorization.

SUMMARY: In accordance with the regulations implementing the Marine Mammal Protection Act (MMPA) as amended, notification is hereby given that we have issued an incidental harassment authorization (IHA) to Ørsted Wind Power LLC (Ørsted) to take small numbers of marine mammals, by harassment, incidental to high-resolution geophysical (HRG) survey investigations associated with marine site characterization activities off the coast of Massachusetts and Rhode Island in the areas of Commercial Lease of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf (OCS). These areas are currently being leased by the Applicant's affiliates, Deepwater Wind New England, LLC and Bay State Wind LLC respectively, and are identified as OCS-A 0486, OCS-A 0487, and OCS-A 0500 (collectively referred to as the Lease Areas). Ørsted is also planning to conduct marine site characterization surveys along one or more export cable route corridors (ECRs) originating from the Lease Areas and landing along the shoreline at locations from New York to Massachusetts, between Raritan Bay (part of the New York Bight) to Falmouth, Massachusetts.

DATES: This authorization is effective one year from the date of issuance.

FOR FURTHER INFORMATION CONTACT: Rob Pauline, Office of Protected Resources, NMFS, (301) 427-8401. Electronic copies of the application and supporting documents, as well as the issued IHA, may be obtained online at: <https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act>. In case of problems accessing these documents, please call the contact listed above.

SUPPLEMENTARY INFORMATION:

Background

The MMPA prohibits the “take” of marine mammals, with certain exceptions. Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361.) direct the Secretary of Commerce (as delegated to NMFS) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are issued or, if the taking is limited to harassment, a notice of a proposed incidental take authorization may be provided to the public for review.

Authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for taking for subsistence uses (where relevant). Further, NMFS must prescribe the permissible methods of taking and other “means of effecting the least practicable adverse impact” on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stocks for taking for certain subsistence uses (referred to in shorthand as “mitigation”); and requirements pertaining to the mitigation, monitoring and reporting of such takings are set forth.

Summary of Request

On March 8, 2019, NMFS received an application from Ørsted for the taking of marine mammals incidental to HRG and geotechnical survey investigations in the OCS-A 0486, OCS-A 0487, and OCS-A 0500 Lease Areas, designated and offered by the Bureau of Ocean Energy Management (BOEM) as well as along one or more ECRs between the southern portions of the Lease Areas and shoreline locations from New York to Massachusetts, to support the development of an offshore wind project. Ørsted's request is for take, by Level B harassment, of small numbers of 15 species or stocks of marine mammals. The application was considered adequate and complete on May 23, 2019. Neither Ørsted nor NMFS expects serious injury or mortality to result from this activity and, therefore, an IHA is appropriate.

NMFS previously issued two IHAs to Ørsted subsidiaries Bay State Wind (81 FR 56589, August 22, 2016; 83 FR 36539, July 30, 2018) and Deepwater Wind (82 FR 32230, July 13, 2017; 83 FR 28808, June 21, 2018) for similar activities. Ørsted has complied with all the requirements (*e.g.*, mitigation, monitoring, and reporting) of the issued IHAs.

Description of the Specified Activity

Overview

The purpose of the HRG surveys in the Lease Area and ECRs is to support the characterization of the existing seabed and subsurface geological conditions. This information is necessary to support the final siting, design, and installation of offshore project facilities, turbines and subsea cables within the project area as well as to collect the data necessary to support the review requirements associated with section 106 of the National Historic Preservation Act of 1966, as amended. Underwater sound resulting from Ørsted's planned site characterization surveys has the potential to result in incidental take of marine mammals. This

take of marine mammals is anticipated to be in the form of harassment and no serious injury or mortality is anticipated, nor is any authorized in this IHA. Ørsted plans to conduct continuous HRG survey operations 24-hours per day (Lease Area and ECR Corridors) using multiple vessels. Based on the planned 24-hour operations, the survey activities for all survey segments would require 666 vessel days total if one vessel were surveying the entire survey line continuously. However, an estimated 5 vessels may be used simultaneously with a maximum of no more than 9 vessels. Therefore, all of the survey will be completed within one year.

A detailed description of the planned survey activities, including types of survey equipment planned for use, is provided in the **Federal Register** notice for the proposed IHA (84 FR 36054; July 26, 2019). Please refer to that **Federal Register** notice for the description of the specified activity.

Comments and Responses

A notice of NMFS' proposal to issue an IHA was published in the **Federal Register** on July 26, 2019 (84 FR 36054). During the 30-day public comment period, NMFS received comment letters from: 1) the Marine Mammal Commission (Commission); 2) the law firm of Gatzke Dillon & Balance LLP representing the community group ACK Residents Against Wind Turbines (ACK Residents); and 3) a group of environmental non-governmental organizations (ENGOS) including the Natural Resources Defense Council, Conservation Law Foundation, National Wildlife Federation, Defenders of Wildlife, WDC North America, NY4WHALES, Wildlife Conservation Society, Surfrider Foundation, Mass Audubon, Ocean Conservation Research, International Marine Mammal Project of the Earth Island Institute, and IFAW – International Fund for Animal Welfare. NMFS has posted the comments online at:

<https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-other-energy-activities-renewable>.

The following is a summary of the public comments received and NMFS' responses.

Comment 1: The Commission recommended that NMFS review the in-situ measured Level B harassment zones submitted by Ørsted and use them rather than the source levels back-calculated from those measurements to inform the extents of the Level B harassment zones.

Response: NMFS has reviewed the in-situ measured Level B harassment isopleth zones at length. When NMFS compared the field sound source verification (SSV) measurements to the source levels measured in a controlled experimental setting (*i.e.*, Crocker and Fratantonio, 2016), we found sizable discrepancies for calculated impact distances for the same equipment that cannot be explained solely by absorption and scattering of acoustic energy. We suspect that these discrepancies are due to the beam pattern of many HRG sources, and the likelihood that many field SSVs were measured outside the main lobe of the source at various degrees. Given this information, NMFS elected to rely on the source levels developed by Crocker and Fratantonio (2016) if such information was available for a specific piece of equipment. If equipment had not been tested in a controlled setting, NMFS used source levels provided by the equipment manufacturer.

Comment 2: The Commission recommended that pulse duration and number of pulses should be used to adjust the respective source levels where appropriate. Furthermore, the Commission recommended that both beam width and operating frequency of the various sources should be used to better inform the extents of the Level B harassment zones and that NMFS should assume a consistent 20logR propagation loss for all Level B harassment zone calculations. The Commission recommended that, if SPLrms-based source levels are used to

inform the extents of the Level B harassment zones, NMFS consult with BOEM regarding how the SPLrms-based source levels from Crocker and Fratantonio (2016) should be used.

Response: Since the Level B harassment threshold is a pressure measurement, energy accumulation over time is not measured. As such, pulse duration and number of pulses is not relevant to calculating Level B harassment thresholds. NMFS is currently working on an interim guidance document that may be used to establish sound source levels and propagation analyses for all HRG sources. Beam width specifications, operating frequencies and a propagation rate of $20\log R$ will likely be used to estimate harassment zones. NMFS will share the guidance document with the Commission once it has been finalized. Furthermore, NMFS has been in discussions with BOEM regarding appropriate uses of source levels from Crocker and Fratantonio (2016).

Comment 3: The Commission recommended that NMFS work with BOEM to develop methodological and signal processing standards for use by action proponents that conduct HRG surveys.

Response: NMFS understands there is a need for such standards and is working collaboratively with BOEM on this effort.

Comment 4: The Commission recommended that NMFS refrain from using the proposed renewal process. The Commission stated that the renewal process should be used sparingly and selectively, by limiting its use only to those proposed incidental harassment authorizations that are expected to have the lowest levels of impacts to marine mammals and that require the least complex analyses. NGOs asserted that NMFS apparently intends the Renewal process to become the rule rather than an exception, citing to a number of proposed IHAs that included requests for comment on a potential Renewal.

Response: As described in the **Federal Register** notice for the proposed IHA (84 FR 36054; July 26, 2019) and on NMFS' website where information on all MMPA incidental take authorization processes is provided, requests for Renewal IHAs are appropriate only in limited and well-defined circumstances. NMFS does not anticipate many projects that would meet *all* the criteria for a Renewal. Nonetheless, information about the Renewal process and the opportunity to comment on a potential Renewal is included in every notice of a proposed IHA because NMFS cannot predetermine who may seek or qualify for a Renewal. Under section 101(a)(5)(D), it is up to an applicant to request incidental harassment authorization; NMFS includes information about the potential Renewal process in all proposed IHAs because it is at least initially up to the applicant to decide whether they want to seek qualification for a Renewal IHA. NMFS has also explained that the possibility of a Renewal must be included in the notice of the initial proposed IHA for the agency to consider a Renewal request, for the purpose of providing adequate opportunity for public comment on the project during the 30-day comment period on the appropriateness of, and any information pertinent to, a Renewal. Where the commenter has likely already reviewed and commented on the initial proposed IHA and a potential Renewal for these same activities, activities by the same IHA holder in the same geographic area, the abbreviated additional comment period is sufficient for consideration of the results of the preliminary monitoring report and new information (if any) from the past months.

NMFS' purpose in providing for Renewals is two-fold. First and foremost, the efficiencies in dealing with these simple, low-impact projects (which have already been fully described and analyzed in the initial IHA) frees up limited staff resources to increase focus on more complex and impactful projects and improves our ability to conserve and protect marine mammals by even better evaluating and utilizing new science, evolving technologies, and

potential new mitigation measures. In addition, while the agency has always striven for efficiency in regulatory processes, recent directives have called for agencies to put processes in place that reduce regulatory timelines and the regulatory burden on the public. The Renewal process reduces the effort needed by both applicants and NMFS staff for simple, relatively low impact projects with little to no uncertainty regarding effects that have already been fully analyzed by the agency and considered by the public—with no reduction in protection to marine mammals.

Comment 5: The Commission argued that the additional 15-day comment period for Renewals places a burden on reviewers who will need to review the original authorization and numerous supporting documents and then formulate comments very quickly.

Response: NMFS has taken a number of steps to ensure the public has adequate notice, time, and information to be able to comment effectively on Renewal IHAs. **Federal Register** notices for proposed initial IHAs identify the conditions under which a one-year Renewal IHA could be appropriate. This information would have been presented in the *Request for Public Comments* section, which encouraged submission of comments on a potential one-year Renewal in addition to the initial IHA during the initial 30-day comment period. With Renewals limited to another year of identical or nearly identical activity in the same location or a subset of the initial activity that was not completed, this information about the Renewal process and the project-specific information provided in the **Federal Register** notice provides reviewers with the information needed to provide information and comment on both the initial IHA and a potential Renewal for the project. Thus reviewers interested in submitting comments on a proposed Renewal during the additional 15-day comment period will have already reviewed the activities, the species and stocks affected, and the mitigation and monitoring measures, which

will not change from the IHA issued, and the anticipated effects of those activities on marine mammals and provided their comments and any information pertinent to a possible Renewal during the initial 30-day comment period. When we receive a request for a Renewal IHA, if the project is appropriate for a Renewal we will publish notice of the proposed IHA Renewal in the **Federal Register** and provide the additional 15 days for public comment to allow review of the additional documents (preliminary monitoring report, Renewal request, and proposed Renewal), which should just confirm that the activities have not changed (or only minor changes), commit to continue the same mitigation and monitoring measures, and document that monitoring does not indicate any impacts of a scale or nature not previously analyzed.

In addition, to minimize any burden on reviewers, NMFS will directly contact all commenters on the initial IHA by email, phone, or, if the commenter did not provide email or phone information, by postal service to provide them direct notice about the opportunity to submit any additional comments.

Comment 6: The Commission and ENGOs expressed concern that the Renewal process discussed in the notice for the proposed IHA is inconsistent with the statutory requirements contained in section 101(a)(5)(D) of the MMPA. The ENGOs asserted that IHAs can be valid for not more than one year and both commenters stated that 30 days for comment, including on Renewal IHAs, is required.

Response: NMFS' IHA Renewal process meets all statutory requirements. All IHAs issued, whether an initial IHA or a Renewal IHA, are valid for a period of not more than one year. And the public has at least 30 days to comment on all proposed IHAs, with a cumulative total of 45 days for IHA Renewals. One commenter characterized the agency's request for comments as seeking comment on the Renewal process and the proposed IHA, but the request

for comments was not so limited. As noted above, the *Request for Public Comments* section made clear that the agency was seeking comment on both the initial proposed IHA and the potential issuance of a Renewal for this project. Because any Renewal (as explained in the *Request for Public Comments* section) is limited to another year of identical or nearly identical activities in the same location (as described in the *Description of Proposed Activity* section) or the same activities that were not completed within the one-year period of the initial IHA, reviewers have the information needed to effectively comment on both the immediate proposed IHA and a possible one-year Renewal, should the IHA holder choose to request one in the coming months. Minor changes were previously made to the description of the Renewal process to make this even clearer.

While there will be additional documents submitted with a Renewal request, for a qualifying Renewal these will be limited to documentation that NMFS will make available and use to verify that the activities are identical to those in the initial IHA, are nearly identical such that the changes would have either no effect on impacts to marine mammals or decrease those impacts, or are a subset of activities already analyzed and authorized but not completed under the initial IHA. NMFS will also confirm, among other things, that the activities will occur in the same location; involve the same species and stocks; provide for continuation of the same mitigation, monitoring, and reporting requirements; and that no new information has been received that would alter the prior analysis. The Renewal request will also contain a preliminary monitoring report, but that is to verify that effects from the activities do not indicate impacts of a scale or nature not previously analyzed. The additional 15-day public comment period provides the public an opportunity to review these few documents, provide any additional pertinent information and comment on whether they think the criteria for a Renewal have been met.

Between the initial 30-day comment period on these same activities and the additional 15 days, the total comment period for a Renewal is 45 days.

In addition to the IHA Renewal process being consistent with all requirements under section 101(a)(5)(D), it is also consistent with Congress' intent for issuance of IHAs to the extent reflected in statements in the legislative history of the MMPA. Through the provision for Renewals in the regulations, description of the process and express invitation to comment on specific potential Renewals in the Request for Public Comments section of each proposed IHA, the description of the process on NMFS' website, further elaboration on the process through responses to comments such as these, posting of substantive documents on the agency's website, and provision of 30 or 45 days for public review and comment on all proposed initial IHAs and Renewals respectively, NMFS has ensured that the public "is invited and encouraged to participate fully in the agency decision-making process." Otherwise the NGOs cite to a House of Representatives' Report that discusses the timing of public comment where a request is received for an IHA identical to one issued in the previous year. But the bill that this report accompanied included a specific provision for renewing IHAs, which was not included in the final public law. Therefore it is unknown how the statement in the House Report relates, if at all, to NMFS' implementation of the statutory provisions that in the end were enacted.

Comment 7: NGOs asserted that NMFS must explain why applicants who conduct activities that may result in incidental harassment of marine mammals for more than one year should not be required to apply under section 101(a)(5)(A), which provides for incidental take authorizations for up to five years.

Response: While all take of marine mammals is prohibited under the MMPA unless authorized or exempted, it is up to the operator to determine whether their activities may result in

the incidental take of marine mammals and therefore whether they should request incidental take coverage from NMFS. This includes it being the applicant's choice, if their activities will result in harassment only, whether to seek a multi-year authorization under section 101(a)(5)(A) or a one-year authorization, with the potential for a one-year Renewal for certain limited projects, under section 101(a)(5)(D). Where Congress provided both options and stated that authorizations proceed "upon request" of the applicant, NMFS cannot "require" an applicant to pursue authorization under a particular provision if they qualify under either.

Comment 8: ACK Residents indicated that the proposed IHA provided no description of the existing noise and vessel traffic conditions within the impact area of the proposed survey activity. Thus, there is no baseline from which to conduct a proper impact analysis.

Response: Ambient ocean noise levels generally do not exceed 100 dB in the Atlantic waters of the Northeast United States (Haver *et al.*, 2018). Noise from ship traffic can temporarily increase ocean noise in a localized area around the vessel. However, the threshold for Level B harassment is 120 dB. Ambient noise levels below that value or brief noise level increases from vessel traffic in a small, localized area have no impact on our analysis.

Comment 9: ACK Residents and the ENGOS noted that the analysis does not evaluate the project's contribution to the cumulative take of marine mammals as it fails to account for existing noise and vessel conditions, as well as other wind energy leases near or adjacent to the Ørsted project area. The ENGOS further recommended that the agency carefully analyze the cumulative impacts from the proposed survey activities on the North Atlantic right whale and other protected species.

Response: The MMPA grants exceptions to its broad take prohibition for a "specified activity." 16 U.S.C. 1371(a)(5)(A)(i). Cumulative impacts (also referred to as cumulative effects)

is a term that appears in the context of NEPA and the ESA, but it is defined differently in those different contexts. Neither the MMPA nor NMFS's codified implementing regulations address consideration of other unrelated activities and their impacts on populations. However, the preamble for NMFS's implementing regulations (54 FR 40338; September 29, 1989) states in response to comments that the impacts from other past and ongoing anthropogenic activities are to be incorporated into the negligible impact analysis via their impacts on the environmental baseline. . Accordingly, NMFS here has factored into its negligible impact analyses the impacts of other past and ongoing anthropogenic activities via their impacts on the baseline (*e.g.*, as reflected in the density/distribution and status of the species, population size and growth rate, and other relevant stressors (such as incidental mortality in commercial fisheries)). Further, as part of the NEPA process, NMFS drafted an environmental assessment (EA) that analyzed potential impacts from past, present, and reasonably foreseeable future actions. These actions included vessel traffic, geophysical and geotechnical surveys (including those from nearby wind development projects), and military readiness activities. NMFS determined that there were no cumulatively significant impacts to marine mammals and their habitat and the agency signed a finding of no significance (FONSI) in September, 2019. The EA/FONSI is available at: <https://www.fisheries.noaa.gov/action/incidental-take-authorization-orsted-wind-power-llc-site-characterization-surveys-renewable>., for this activity and NMFS' authorization of incidental take of right whales and other ESA-listed species in the Biological Opinion issued in April 2013 as part of a programmatic consultation between BOEM and NMFS. NMFS' biological opinion was that the proposed action is not likely to jeopardize the continued existence of identified ESA-listed species. It is also NMFS' opinion that the proposed action is not likely to destroy or adversely modify designated North Atlantic right whale critical habitat.

Comment 10: ACK Residents argued that the analysis did not assess the project's potential to cause vessel strikes and that NMFS should have quantified the number of vessels, project-related vessel miles, or vessel density and then correlated this figure to the number of marine mammals that may be present in the impact area. Without this information, ACK Residents felt it was impossible to determine whether the proposed mitigation measures can be effectively implemented and whether they would successfully reduce take-related impacts on the marine mammal species.

Response: NMFS clearly stated in the proposed IHA that between 5 and 9 survey vessels would be used concurrently. NMFS did analyze the potential effects of use of multiple vessels in the EA. Given the size of the survey area, the relatively low density of marine mammal species authorized for take, slow vessel speeds, and additional required vessel strike avoidance measures, NMFS has determined the likelihood of vessel strike as a result of the surveys to be so low as to be discountable. There have been no reported ship strikes of species during multiple HRG surveys for which NMFS has issued incidental take authorizations. Further, Ørsted shall implement measures (*e.g.*, vessel speed restrictions, separation distances, protected species observer (PSO) monitoring and shutdown requirements) to reduce the risk of a vessel strike to marine mammal species.

Comment 11: ACK Residents noted that the analysis fails to assess noise impacts on whale communication and navigation, both of which rely on echolocation and sound transmission.

Response: In the section on *Potential Effects of the Specified Activity on Marine Mammals and Their Habitat* contained in the proposed IHA, NMFS included a subsection on the potential effects of masking. The comparatively lower source levels and higher frequencies of

the sources used in these activities mean that sound attenuates at relatively short distances from the source and is unlikely to meaningfully add to background noise in the area. NMFS determined that while some number of marine mammals may be subject to occasional masking as a result of survey activity, temporary shifts in calling behavior to reduce the effects of masking, on the scale of no more than a few minutes, are not likely to result in failure of an animal to feed successfully, breed successfully, or complete its life history. Please refer to that section for additional detail.

Comment 12: ACK Residents and the ENGOs commented that the proposed IHA analysis failed to examine the extent to which marine mammals, in response to the noise emitted by the survey equipment and/or the threats posed by project-related vessels, would move out of the project area. Additionally, they felt that NMFS did not evaluate the potential negative impacts that displaced marine mammals would sustain, including indirect ship strike resulting from increased vulnerability to other vessels not subject to the mitigation measures imposed on Ørsted vessels.

Response: NMFS determined that habitat displacement was not an expected outcome of the specified activity. As discussed in the notice for the proposed IHA (84 FR 36054; July 26, 2019), we anticipate marine mammals may temporarily avoid the area of disturbing noise, but this would be a relatively small area even when multiple survey are operating concurrently. The Level B harassment zone was conservatively estimated to be only 178 m around any participating survey vessels and is actually smaller (maximum of 141 m) as described later in the Estimated Take section. Additionally, any potential effects are expected to be short-term, given the movement of both whales and boats and the small overall area of potential overlap and response. Therefore, habitat displacement is not reasonably likely to occur. Furthermore, if an

aggregation of right whales concentrated in a feeding area, they should be readily observed by PSOs and survey vessels would be required to employ vessel strike avoidance measures including maintaining a separation distance of at least 500 m.

Comment 13: ACK Residents pointed out that NMFS omitted a required element of a proper harassment assessment - namely, that the agency failed to correlate the anticipated take of each individual marine mammal species to its overall stock or population.

Response: As a result of the analysis of the anticipated effects and authorized take described in the *Negligible Impact Determination* section, NMFS found that that the total marine mammal take from Ørsted's planned HRG survey activities will have a negligible impact on each of the affected marine mammal species or stocks. Specifically, the nature and scale of the take authorized for this activity is such that no impacts to reproduction or survival of any individuals are predicted, and therefore no impacts to the stocks are anticipated to follow. Additionally, NMFS concluded in the *Small Numbers* section that the numbers of marine mammals authorized for take, for all species and stocks, would be considered small relative to the relevant stocks or populations. Please refer to that section for additional detail.

Comment 14: ACK Residents expressed concern that the operating frequency assumed in the analysis may not be the one used in the field during the actual survey work and, therefore, much of the analysis is meaningless.

Response: The operating frequencies used as part of the analysis were supplied by the equipment manufacturer. NMFS assumed that the primary operating frequency was the midpoint between the high and low ranges of HRG equipment. NMFS acknowledges that the actual operating frequencies utilized for specific equipment during survey activities may not be the midpoints. However, use of other frequencies within the manufacturers' supplied ranges would

have no effect on our analysis, including Level B harassment zone sizes or calculated take numbers. In this case, sound frequency was not used as a factor in the determination of Level B harassment isopleths, which was a conservative choice, given that the sound from higher frequency sources (such as those used here) actually attenuates more quickly, resulting in smaller isopleths and harassment zones.

Comment 15: Since NMFS is authorizing 10 right whale takes by Level B harassment, ACK Residents contend that NMFS must lack confidence that the mitigation measures will work.

Response: NMFS understands that the required mitigation and monitoring measures may not be 100 percent effective under all conditions. Due to night time operations over an extended period (666 vessel days), NMFS acknowledges that a limited number of right whales may enter into the Level B harassment zone without being observed. Therefore, NMFS has conservatively authorized take of 10 right whales by Level B harassment.

Comment 16: ACK Residents noted that the analysis needs to disclose is whether the surveys will take place during those times of year when each marine mammal species is expected to be present in the project impact area. That information is not provided.

Response: NMFS indicated that survey activities for all survey segments would require 666 vessel days total if one vessel were surveying the entire survey line. Activities are likely to be continuous throughout the one-year effective period. To account for seasonal density variance, density data were mapped within the boundary of the survey area for each segment using geographic information systems. For each survey segment, the maximum densities for each season (spring, summer, fall and winter) as reported by Roberts *et al.* (2016b; 2017; 2018), were averaged to establish an annual density for the entire year.

Comment 17: According to ACK Residents, recent data not included in the analysis shows that more right whales are moving into or near the project area. This means that the number of right whales potentially affected by the project is likely higher than assumed in the analysis. Additionally, the ENGOs felt that the density maps produced by Roberts *et al.* (2016) did not fully reflect the abundance, distribution, and density of marine mammals for the U.S. East Coast and therefore should not be the only information source relied upon when estimating take.

Response: NMFS has determined that the data provided by Roberts *et al.* (2016; 2017; 2018) represents the best available information concerning marine mammal density in the survey area and has used it accordingly. NMFS has considered other available information, and determined that it does not contradict the information provided by Roberts *et al.* (2016; 2017; 2018). The sources suggested by the commenters do not provide data in a format that is directly usable in an acoustic exposure analysis. The references were either anecdotal or did not contain density information. Additionally, and as explained in greater detail in the Estimated Take section, a recent marine mammal monitoring report covering Lease Area OCS-A 0500 and nearby ECR corridors did not record any confirmed right whale sightings from 3 separate HRG survey vessels over a combined period of 376 vessel days. We will continue to review data sources, including those recommended by commenters for consideration for their suitability for inclusion in future analyses to ensure the use of best available science in our analyses.

Comment 18: ACK Residents and the ENGOs alleged that NMFS did not explain or analyze the extent to which the planned "concurrent" use of HRG survey equipment changes the noise analysis or increases the potential take risk to marine mammals.

Response: NMFS addressed the concurrent use of multiple survey vessels and equipment in the EA. Given the size of the survey area, these vessels may be operating at considerable distance from one another. In some instances, however, vessels would be no closer than 500 m to each other. Since the largest Level B harassment isopleth is 178 m, there is no chance that the sound fields exceeding the Level B harassment threshold generated by each vessel would overlap and either increase the predicted received sound levels above established thresholds or increase cumulative exposure beyond what has been modelled. Furthermore, multiple vessels on the water means that more PSOs would be active and, therefore, would be more capable of detecting species of concern. This information would be distributed among operating survey vessels, potentially reducing impacts to such species. Importantly, the use of multiple survey vessels as well as autonomous survey vehicles (ASVs) concurrently will decrease the total number of days during which anthropogenic sound is introduced into the marine environment.

Comment 19: ACK Residents asserted that since right whales can dive deeply and spend significant amount of time underwater, they may not be visually detected, even by trained PSOs using high-powered binoculars and night-vision goggles.

Response: NMFS finds visual observation by PSOs to be generally effective in detecting and helping to mitigate less cryptic (*e.g.*, non-deep divers), larger marine mammal species (such as right whales), especially in shallower waters such as those in the activity area.

Comment 20: ENGOs recommended that NMFS impose a restriction on site assessment and characterization activities that have the potential to injure or harass the North Atlantic right whale (*i.e.*, source level >180 dB re 1 uPa) minimally from November 1st to May 14th in the Lease Areas.

Response: In evaluating how mitigation may or may not be appropriate to ensure the least practicable adverse impact on species or stocks and their habitat, we carefully consider two primary factors: (1) The manner in which, and the degree to which, the successful implementation of the measure(s) is expected to reduce impacts to marine mammals, marine mammal species or stocks, and their habitat; and (2) the practicability of the measures for applicant implementation, which may consider such things as relative cost and impact on operations.

NMFS is concerned about the status of the North Atlantic right whale population given that a UME has been in effect for this species since June of 2017 and that there have been a number of recent mortalities. While NMFS expects that the effects of a single HRG survey would be less impactful than those of some other larger sources of concern, the potential impacts of multiple HRG vessels (5-9 according to Ørsted) operating simultaneously in areas of higher right whale density are not well-documented and warrant caution. NMFS reviewed the best available right whale abundance data for the planned survey area extending from southern New England to southern Long Island (Roberts *et al.* 2017). We determined that right whale abundance is significantly higher in the period starting in late winter and extending to late spring in the eastern portion of the survey area.

Ørsted anticipates that approximately 25% of the Lease Area vessel days (78) may occur between March and June, the months in which right whale density in the Lease Areas is highest. Also, no more than 5% of the total vessel days (33) are anticipated for the ECR area north of the lease areas between February and April, an area and season in which right whale densities are also comparatively higher. While this greater detail regarding the likely spatio-temporal distribution of surveys across the action area alleviates some concerns (*i.e.*, showing that survey

are days are not disproportionately concentrated in the high-density areas and times), NMFS worked with Ørsted to further limit impacts by limiting the number of surveys that will operate concurrently in the Lease Areas in high-density months. Ørsted plans to operate one to two vessels concurrently, with up to three vessels for short periods of time – and has committed to operate no more than 3 HRG survey vessels concurrently from March through June within the three identified lease areas (OCS-A 0486, 0487, and 0500) and ECR areas north of the lease areas up to, but not including, coastal and bay waters. This requirement is included in the IHA.

Limiting the number of survey vessels operating concurrently during high-density months in high-density areas will help to reduce both the number and intensity of right whale takes. Regarding practicability, the timing of Ørsted's surveys is driven by a complex suite of factors including availability of vessels and equipment (which are used for other surveys and by other companies), other permitting timelines, and the timing of certain restrictions associated with fisheries gear, among other things. Nonetheless, Ørsted has indicated that there is enough flexibility to revise their survey plan such that they can both accommodate this measure and satisfy their permitting and operational obligations, and we do not anticipate that these restrictions will impact Ørsted's ability to execute their survey plan within the planned 666 vessel days. Therefore, NMFS determined that this required mitigation measure is sufficient to ensure the least practicable adverse impact on species or stocks and their habitat.

Comment 21: The ENGOs recommended that geophysical surveys should commence, with ramp up, during daylight hours only to maximize the probability that marine mammals are detected and confirmed clear of the exclusion zone. They state that if a right whale is detected in the EZ at night and the survey shuts down, the survey should not resume until daylight hours.

Response: We acknowledge the limitations inherent in detection of marine mammals at night. However, similar to the discussion above regarding time closures, restricting the ability of the applicant to ramp-up surveys only during daylight hours would have the potential to result in lengthy shutdowns of the survey equipment, which could result in the applicant failing to collect the data they have determined is necessary, which could result in the need to conduct additional surveys the following year. This would result in significantly increased costs incurred by the applicant. Thus the restriction suggested by the commenters would not be practicable for the applicant to implement. In addition, potential impacts to marine mammals authorized for take would be limited to short-term behavioral responses. Restricting surveys in the manner suggested by the commenters may reduce marine mammal exposures by some degree in the short term, but would not result in any significant reduction in either intensity or duration of noise exposure. No injury is expected to result even in the absence of mitigation, given the very small estimated Level A harassment zones. In the event that NMFS imposed the restriction suggested by the commenters, vessels would potentially be on the water for an extended time introducing noise into the marine environment. Therefore, in addition to practicability concerns for the applicant, the restrictions recommended by the commenters could result in the surveys spending increased time on the water, which may result in greater overall exposure to sound for marine mammals; thus the commenters have not demonstrated that such a requirement would result in a net benefit. In consideration of potential effectiveness of the recommended measure and its practicability for the applicant, NMFS has determined that restricting survey start-ups to daylight hours is not warranted in this case.

Comment 22: The ENGOs stated that is incumbent upon the agency to address potential impacts to other endangered and protected whale species, particularly in light of the UMEs

declared for right whales, humpback whales and minke whales, as well as the several strategic and/or depleted stocks of small cetaceans that inhabit the region.

Response: NMFS acknowledges the UMEs for minke whales since January 2017; north Atlantic right whales since June 2017; humpback whales since January 2016, and pinnipeds since July 2018. We discuss the potential impacts of HRG surveys on species for which UMEs have been declared and for which take is authorized in the *Negligible Impact Determination* section. Please refer to that discussion.

Comment 23: The ENGOs urged NMFS to fund analyses of recently collected sighting and acoustic data for all data-holders; and continue to fund and expand surveys and studies to improve our understanding of distribution and habitat use of marine mammals

Response: We agree with the ENGOs that analyses of recently collected sighting and acoustic data, as well as continued marine mammal surveys, are warranted, and we welcome the opportunity to participate in fora where implications of such data for potential mitigation measures would be discussed; however, we do not have broad statutory authority or the ability to require that all “data-holders” fund such analyses and surveys. Additionally, NMFS will fund pertinent surveys based on agency priorities and budgetary considerations.

Comment 24: The ENGOs indicated that NMFS should review and approve night vision and infrared equipment prior to reliance on this untested technology to reduce survey risk. Additionally, the ENGOs commented that NMFS should encourage developers to partner with scientists to collect data that would increase the understanding of the effectiveness of night vision and infrared technologies in the Northeast region.

Response: NMFS agrees with the ENGOs that improved data on relative effectiveness of night vision and infra-red technologies would be beneficial and could help to inform future

efforts at detection of marine mammals during nighttime activities. Currently, there are no existing standards that NMFS could use to approve night vision and infrared equipment. Right whales can be seen at night from a considerable distance, depending on conditions. Note that in a recent IHA monitoring report submitted to NMFS after completion of an HRG survey off the coast of Delaware (Deepwater Wind , 83 FR 28808, June 21, 2018) a single confirmed right whale and a second probable right whale were observed at night by infra-red cameras at distances of 1,251 m and approximately 800 m respectively.

The commenters have not provided us with any specific recommendations to evaluate beyond a broad recommendation. However, we will encourage coordination and communication between offshore wind developers and researchers on effectiveness of night vision and infra-red technologies, to the extent possible. While we acknowledge that no technology is 100% effective either during daylight or nighttime hours, the equipment used here will enhance PSO's ability to detect marine mammals at night and the fact that not all will be detected is accounted for in the authorized take.

Comment 25: The ENGOs maintained that the minimum radii of EZs should be increased and maintained throughout survey activities. NMFS must require use of sufficient monitoring practices to ensure a 500-m EZ for all marine mammals around all vessels conducting activities with noise levels that could result in injury or harassment to these species. PSOs should also, to the extent feasible, monitor beyond the minimum 500-m EZ to an extended 1,000 m-EZ for North Atlantic right whales. Additionally, the ENGOs recommended that survey activity must be shut down upon the visual or acoustic detection of a North Atlantic right whale.

Response: Regarding the recommendation for a 1,000 m EZ specifically for North Atlantic right whales, we have determined that the 500-m EZ, as required in the IHA, is

sufficiently protective. We note that the 500-m EZ exceeds by almost three times the modeled distance to the largest Level B harassment isopleth (178 m). Thus for North Atlantic right whales detected by PSOs, all forms of incidental take (both injury and behavioral harassment) would be avoided. For the same reason we are not requiring shutdown if a right whale is observed beyond 500 m, presumably at any distance. Similarly, the recommended 500-m EZ for other species is overly conservative when a 178 m isopleth has been modeled for behavioral harassment.

Comment 26: The ENGOs recommended that a combination of visual monitoring by PSOs and passive acoustic monitoring (PAM) should be used at all times.

Response: There are several reasons why we do not think the use of PAM is warranted for surveys using the HRG sound sources planned for use by Ørsted. PAM can be an important tool for augmenting detection capabilities in certain circumstances, however, its utility in further reducing impact for Ørsted's HRG activities is very limited. First, for this activity, the area expected to be ensonified above the level B harassment threshold are relatively small (and as described in the Take Estimate section, even smaller than indicated in the proposed IHA, a maximum of 141 m as described in the Estimated Take section). PAM is only capable of detecting animals that are actively vocalizing while many marine mammal species vocalize infrequently or during certain activities, which means that only a subset of the animals within the range of the PAM will be detected (and potentially have reduced impacts). Additionally, localization and range detection can be challenging for under certain scenarios. For example, odontocetes are fast moving and often travel in large or dispersed groups which make estimating their localization difficult. Also, the ability of PAM to detect baleen whale vocalizations is further limited due to being deployed from the stern of a vessel, which puts the PAM hydrophones in proximity to propeller noise and low frequency engine noise that can mask the

low frequency sounds emitted by baleen whales, including right whales. Last, as noted previously, Ørsted has detected low numbers of marine mammals in previous surveys, and even lower numbers necessitating a shutdown because of the small size of the zone. As an example, the recent monitoring report submitted for Lease Area OCS-A 0500 and nearby ECR corridors recorded 496 sightings of marine mammals over 376 vessel days. (A sighting could be a single animal or group of animals observed in the same area at the same time.) However, only 51 of the sightings required any type of mitigation action (44 shutdown and 7 delay events). Given the low sightings rate (1.3 per vessel day) and mitigation rate (1 mitigation action per 7.3 vessel days), the addition of this detection capability (assuming that it would add as many shutdowns again as assumed for visual mitigation, which may be an overestimate) is likely to have only a nominal effect on reducing potential impacts to marine mammals in the survey area.

Given that the effects to marine mammals from the types of surveys authorized in this IHA are expected to be limited to low level behavioral harassment even in the absence of mitigation, the limited additional benefit anticipated by adding this detection method (especially for right whales and other low frequency species), and the cost and impracticability of implementing a PAM program, we have determined the current requirements for visual monitoring are sufficient to ensure the least practicable adverse impact on the affected species or stocks and their habitat.

Comment 27: The ENGOs recommended that shift schedule of the NMFS-approved PSOs aboard the survey vessel must also be adjusted to a minimum of four PSOs following a two-on two-off rotation, each responsible for scanning no more than 180° of the EZ at any given time.

Response: Previous IHAs issued for HRG surveys have required that a single PSO must be stationed at the highest vantage point and engaged in general 360-degree scanning during daylight hours. A number of marine mammal monitoring reports submitted to NMFS have effectively employed this approach. NMFS sees no reason to deviate from this practice at the present time, as any added benefit would be limited and uncertain versus the known added cost. However, NMFS will require the use of 2 PSOs any time that (ASVs) are being used as well as during night operations.

Comment 28: The ENGOs recommended that all vessels operating within the survey area, including support vessels, should maintain a speed of 10 knots or less during the entire survey period including those vessels transiting to/from the survey area.

Response: NMFS has analyzed the potential for ship strike resulting from Ørsted's activity and has determined that the mitigation measures specific to ship strike avoidance are sufficient to avoid the potential for ship strike. These include: A requirement that all vessel operators comply with 10 knot (18.5 kilometer (km)/hour) or less speed restrictions in any SMA or Dynamic Management Area (DMA); a requirement that all vessel operators reduce vessel speed to 10 knots (18.5 km/hour) or less when any large whale, any mother/calf pairs, pods, or large assemblages of non-delphinoid cetaceans are observed within 100 m of an underway vessel; a requirement that all survey vessels maintain a separation distance of 500-m or greater from any sighted North Atlantic right whale; a requirement that, if underway, vessels must steer a course away from any sighted North Atlantic right whale at 10 knots or less until the 500-m minimum separation distance has been established; and a requirement that, if a North Atlantic right whale is sighted in a vessel's path, or within 500 m of an underway vessel, the underway vessel must reduce speed and shift the engine to neutral. We have determined that the ship strike

avoidance measures are sufficient to ensure the least practicable adverse impact on species or stocks and their habitat. As noted previously, occurrence of vessel strike during surveys is extremely unlikely based on the low vessel speed of approximately 4 knots (7.4 km/hour) while transiting survey lines.

Comment 29: The ENGOs suggested that it should be NMFS' top priority to consider any initial data from State monitoring efforts, passive acoustic monitoring data, opportunistic marine mammal sightings data, and other data sources, and to take steps now to develop a dataset that more accurately reflects marine mammal presence so that it is in hand for future IHA authorizations and other work.

Response: NMFS will review any recommended data sources and will continue to use the best available information. We welcome future input, even outside the comment period for this particular IHA, from interested parties on data sources that may be of use in analyzing the potential presence and movement patterns of marine mammals, including North Atlantic right whales, in New England waters.

Comment 30: The ENGOs asserted that collectively, the agency's assumptions regarding mitigation effectiveness are unfounded and cannot be used to justify any reduction in the number of takes authorized. The ENGOs stressed that NMFS must not adjust take numbers for endangered North Atlantic right whales based on arbitrary and capricious assumptions regarding the effectiveness of unproven mitigation measures which include the following: (i) the agency's reliance on a 160 dB threshold for behavioral harassment is not supported by best available scientific information in other low- to mid-frequency sources that indicates Level B takes will occur with near certainty at exposure levels well below the 160 dB threshold; (ii) the best available scientific information on habitat use of the Lease Areas, including as an increasingly

important foraging site, has not been considered by the agency (iii) the geographic and temporal extent, and the 24-hour nature, of the survey activities proposed to be authorized; (iv) the assumption that marine mammals will take measures to avoid the sound even though studies have not found avoidance behavior to be generalizable among species and contexts, and even though avoidance may itself constitute take under the MMPA; and (v) the monitoring protocols the agency prescribes for the EZ are under-protective. The ENGOs pointed out that the mitigation measures in the proposed IHA are overall less protective than previous IHA authorizations issued for the region.

Response: The five comments provided by the ENGOs are addressed individually below.

(i) NMFS acknowledges that the potential for behavioral response to an anthropogenic source is highly variable and context-specific and acknowledges the potential for Level B harassment at exposures to received levels below 160 dB rms. Alternatively, NMFS acknowledges the potential that not all animals exposed to received levels above 160 dB rms will not respond in ways constituting behavioral harassment. There are a variety of studies indicating that contextual variables play a very important role in response to anthropogenic noise, and the severity of effects are not necessarily linear when compared to a received level (RL). The studies cited in the comment (Nowacek *et al.*, 2004 and Kastelein *et al.*, 2012 and 2015) showed there were behavioral responses to sources below the 160 dB threshold, but also acknowledge the importance of context in these responses. For example, Nowacek *et al.*, 2004 reported the behavior of five out of six North Atlantic right whales was disrupted at RLs of only 133-148 dB re 1 μ Pa (returning to normal behavior within minutes) when exposed to an alert signal. However, the authors also reported that none of the whales responded to noise from transiting vessels or playbacks of ship noise even though the RLs were at least as strong, and contained

similar frequencies, to those of the alert signal. The authors state that a possible explanation for whales responded to the alert signal and did not respond to vessel noise is due to the whales having been habituated to vessel noise, while the alert signal was a novel sound. In addition, the authors noted differences between the characteristics of the vessel noise and alert signal which may also have played a part in the differences in responses to the two noise types. Therefore, it was concluded that the signal itself, as opposed to the RL, was responsible for the response. DeRuiter *et al.* (2012) also indicate that variability of responses to acoustic stimuli depends not only on the species receiving the sound and the sound source, but also on the social, behavioral, or environmental contexts of exposure. Finally, Gong *et al.* (2014) highlighted that behavioral responses depend on many contextual factors, including range to source, RL above background noise, novelty of the signal, and differences in behavioral state. Similarly, Kastelein *et al.*, 2015 (cited in the comment) examined behavioral responses of a harbor porpoise to sonar signals in a quiet pool, but stated behavioral responses of harbor porpoises at sea would vary with context such as social situation, sound propagation, and background noise levels.

NMFS uses 160 dB (rms) as the exposure level for estimating Level B harassment takes and is currently considered the best available science, while acknowledging that the 160 db rms step-function approach is a simplistic approach. However, there appears to be a misconception regarding the concept of the 160 dB threshold. While it is correct that in practice it works as a step-function, *i.e.*, animals exposed to received levels above the threshold are considered to be “taken” and those exposed to levels below the threshold are not, it is in fact intended as a sort of mid-point of likely behavioral responses (which are extremely complex depending on many factors including species, noise source, individual experience, and behavioral context). What this means is that, conceptually, the function recognizes that some animals exposed to levels below

the threshold will in fact react in ways that are appropriately considered take, while others that are exposed to levels above the threshold will not. Use of the 160-dB threshold allows for a simplistic quantitative estimate of take, while we can qualitatively address the variation in responses across different received levels in our discussion and analysis.

Overall, we reiterate the lack of scientific consensus regarding what criteria might be more appropriate. Defining sound levels that disrupt behavioral patterns is difficult because responses depend on the context in which the animal receives the sound, including an animal's behavioral mode when it hears sounds (*e.g.*, feeding, resting, or migrating), prior experience, and biological factors (*e.g.*, age and sex). Other contextual factors, such as signal characteristics, distance from the source, and signal to noise ratio, may also help determine response to a given received level of sound. Therefore, levels at which responses occur are not necessarily consistent and can be difficult to predict (Southall *et al.*, 2007; Ellison *et al.*, 2012; Bain and Williams, 2006). Further, we note that the sounds sources and the equipment used in the specified activities are outside (higher than) of the most sensitive range of mysticete hearing.

There is currently no agreement on these complex issues, and NMFS followed the practice at the time of submission and review of this application in assessing the likelihood of disruption of behavioral patterns by using the 160 dB threshold. This threshold has remained in use in part because of the practical need to use a relatively simple threshold based on available information that is both predictable and measurable for most activities. We note that the seminal review presented by Southall *et al.* (2007) did not suggest any specific new criteria due to lack of convergence in the data. NMFS is currently evaluating available information towards development of guidance for assessing the effects of anthropogenic sound on marine mammal behavior. However, undertaking a process to derive defensible exposure-response relationships is

complex (*e.g.*, NMFS previously attempted such an approach, but is currently re-evaluating the approach based on input collected during peer review of NMFS (2016)). A recent systematic review by Gomez *et al.* (2016) was unable to derive criteria expressing these types of exposure-response relationships based on currently available data.

NMFS acknowledges that there may be methods of assessing likely behavioral response to acoustic stimuli that better capture the variation and context-dependency of those responses than the simple 160 dB step-function used here, there is no agreement on what that method should be or how more complicated methods may be implemented by applicants. NMFS is committed to continuing its work in developing updated guidance with regard to acoustic thresholds, but pending additional consideration and process is reliant upon an established threshold that is reasonably reflective of available science.

(ii) The ENGOs contended that NMFS did not use the best available scientific information on habitat use of the Lease Areas, including areas that are increasingly important foraging sites. The ENGOs referenced articles by Kraus *et al.* (2016) and Leiter *et al.* (2017) which examined right whale occurrence in offshore wind energy areas near Massachusetts and Rhode Island. To identify areas with statistically higher animal clustering than surrounding regions, a hot spot analysis was performed. Several hot spots were identified within the Lease Areas. However, the right whale densities in the study area ranged from 0.0008 (Winter 2014) to 0.0035 (Spring 2012) animals per km². The densities from these references are generally lower than those used in our own analysis which ranged from 0.00379 (Lease area OCS-A0487) to 0.00759 (ECR corridors) animals per km². The densities used by NMFS from Roberts *et al.* (2016; 2017; 2018) are more conservative or protective than those measured in the referenced right whale hot spot papers.

(iii) Given the geographic and temporal extent of the survey area as well as continuous 24-hour operations, the ENGOs question the effectiveness of the mitigation measures proposed to be authorized. They specifically recommended that seasonal restrictions should be established and consideration should be given species for which a UME has been declared. NMFS is requiring Ørsted to comply with seasonal restrictions limiting the number of vessels that can operate concurrently in the Lease Areas and the area north of that (higher density areas for right whales) during the higher density months of the year. Please refer to the response to Comment 19 for additional detail. Furthermore, we have established a 500-m shutdown zone for right whales which is precautionary considering the Level B harassment isopleth for the largest source utilized in the specified activities for this IHA is was initially estimated at 178-m. Further, actual isopleths are no greater than 141 m for one omnidirectional HRG device (Applied Acoustics Dura-Spark 400 System) and are considerably less for a number of other HRG devices employing downward facing beams at various angles. We determined that the Level B harassment isopleths are smaller than 178 m (maximum of 141 m) for the entire survey area. After accounting for these smaller zones the calculated right whale exposures decreased from 100 to 47 animals. At these distances, monitoring by PSOs is expected to be highly effective. Given these factors, we are confident in our decision to authorize 10 takes by Level B harassment. Additionally, similar mitigation measures have been required in several previous HRG survey IHAs and have been successfully implemented.

(iv) The commenters disagreed with NMFS' assumption that marine mammals move away from sound sources. The ENGOs claimed that studies have not found avoidance behavior to be generalizable among species and contexts, and even though avoidance may itself constitute take under the MMPA. Importantly, the commenters mistakenly seem to believe that the NMFS'

does not consider avoidance as a take, and that the concept of avoidance is used as a mechanism to reduce overall take – this is not the case. Avoidance of loud sounds is a well-documented behavioral response, and NMFS often accordingly accounts for this avoidance by reducing the number of injurious exposures, which would occur in very close proximity to the source and necessitate a longer duration of exposure. However, when Level A harassment takes are reduced in this manner, they are changed to Level B harassment takes, in recognition of the fact that this avoidance or other behavioral responses occurring as a result of these exposures are still take. NMFS does not reduce the overall amount of take as a result of avoidance.

(v) For additional discussion, NMFS directs the reader to the Potential Effects section. Observed responses of wild marine mammals to loud pulsed sound sources (typically airguns or acoustic harassment devices) have been varied but often consist of avoidance behavior or other behavioral changes suggesting discomfort (Morton and Symonds, 2002; see also Richardson *et al.*, 1995; Nowacek *et al.*, 2007). Avoidance responses have more commonly been reported for baleen whales. Avoidance responses to airgun sounds at received levels of 160-170 dB have been reported for migrating gray whales (Malme *et al.*, 1983), bowhead whales (Richardson *et al.*, 1986), and migrating humpback whales (McCauley *et al.*, 2000). Fin whales moved away from a 10-day seismic survey in the Mediterranean and were spatially displaced for at least 14 days after the seismic airgun shooting period (Castellote *et al.*, 2012). Harbor porpoises have been reported to exhibit an avoidance response to the impulsive sound of pile driving at distances of 20 km or more and for up to 3 days (Tougaard *et al.*, 2009; Thompson *et al.*, 2010; Brandt *et al.*, 2011). Avoidance may be short-term, with animals returning to the area once the noise has ceased (*e.g.*, Bowles *et al.*, 1994; Goold, 1996; Stone *et al.*, 2000; Morton and Symonds, 2002; Gailey *et al.*, 2007). Longer-term displacement is possible in an affected region

if habituation to the presence of the sound does not occur (*e.g.*, Bejder *et al.*, 2006; Teilmann *et al.*, 2006). However, long-term displacement is not expected to occur as a result of this HRG survey. While there is no direct evidence that noise from HRG surveys will result in movement away from the sound source, the studies above would indicate that at least some cetacean species engage in avoidance behavior when exposed to underwater noise at certain levels and frequencies. As described above, however, avoidance behavior is likely dependent on additional contextual factors that are not well-understood at this time.

(vi) The ENGOs felt that that the monitoring protocols prescribed by NMFS are under-protective while noting that the protocols are less protective than those required as part of previous IHA authorizations covering HRG surveys. NMFS believes that implementation of the required monitoring protocols are adequate to ensure the least practicable adverse impact on the effected species or stocks and their habitat and, further, as we have described, we have determined that the number of animals taken will be small and that potential impacts to any stocks will be negligible. While some previously issued IHAs have required the use of PAM, NMFS described why we do not believe this is necessary in our response to Comment 25. Previous IHAs did require a 500-m right whale exclusion zone, a 200-m exclusion zone for listed whale species, 25-m zone for harbor porpoises and no exclusion zone for non-listed species. The IHA issued to Ørsted also has a 500-m right whale exclusion zone. However, it also has a 100-m exclusion zone for all other listed and non-listed marine mammal species, including harbor porpoise. While the previous IHAs offered slightly increased protection for listed whale species (200 m vs 100 m), the current IHA offers increased protection for all other non-listed species (0 m vs 100 m) including harbor porpoise (25 m vs 100 m). Importantly, the previous IHA had a significantly larger Level B harassment zone (447 m), resulting in a much larger area within

which marine mammals might be harassed outside of the exclusion zone. Given this information it is not clear how the previous IHAs can be categorized as being more protective than the current IHA.

As described above, the number of right whales that could actually experience Level B harassment is smaller than what is projected assuming a 178-m isopleth. The HRG device with the largest omnidirectional isopleth (141 m) is the Applied Acoustics Dura-Spark 400 System. Much of the remaining HRG equipment uses focused beams with further reduces the calculated Level B isopleths since these distances were derived assuming that all sound sources were omnidirectional. When 141-m isopleth associated with the Applied Acoustics Dura-Spark 400 System is taken into consideration (versus the 178 m considered in the proposed IHA), the calculated take of right whales is reduced from 100 to 47 exposures.

The 500-m shutdown zone for right whales is highly conservative. When the directionality of the sound source is considered, the largest Level B harassment isopleth for this IHA is 141 m with much of remaining directional HRG equipment having behavioral disturbance zones that are considerably smaller. At these reduced distances, PSOs should be able to successfully monitor for right whales and other species, even during night operations with the assistance of night vision and infra-red devices. As noted in the response to Comment 18, visual observation by PSOs is generally effective in detecting larger marine mammal species, including right whales, especially in shallower waters.

Given the low occurrence of right whale observations as depicted in the recent marine mammal monitoring report (0 confirmed sightings) over an extended period (376 days), the substantially reduced Level B harassment zone sizes and associated exposure estimates, the seasonal reduction in the number of survey vessels permitted to operate concurrently in high

density areas (3), as well as the expected efficacy of mitigation and monitoring measures, a reduction in the calculated exposure estimates of 47 right whales (initially 100 exposures as described previously) to 10 is justifiable.

Changes from Proposed to Final Authorization

NMFS has made several minor changes to the mitigation and monitoring measures since the publication of the proposed IHA which are listed below:

- NMFS has removed several genera (*i.e.* *Lagenodelphis*, *Lissodelphis*, *Steno*) from the list of species for which the shutdown requirement is waived. The removed species do not occur in New England waters.
- NMFS had identified a 100-m exclusion zone for large cetaceans (*i.e.*, humpback whale, sperm whale, minke whale, pilot whale, Risso's dolphin) in the proposed IHA while in the final IHA the 100-m shutdown zone has been revised to include all marine mammals. NMFS inadvertently excluded revised language from text of the proposed IHA.
- NMFS is requiring Ørsted to restrict concurrent operation of survey vessels to a maximum of three from March through June within the three lease areas and in ECR areas north up to, but not including, coastal and bay waters. This change was made in consideration of a public comment.
- The final IHA states that if an animal is sighted within or approaching the pre-clearance zones the applicant must not use HRG equipment until the animal is observed leaving the zone or a period of 15 minutes has passed with no further sightings of small cetaceans or seals. The proposed IHA indicated that the 15 minute waiting period was only applicable to small cetaceans. Seals have reportedly been observed approaching or

in close proximity to survey vessels. Therefore, this language has been added to provide more specific guidance to PSOs.

- The proposed IHA indicated that the shutdown requirement is waived for several small delphinids of specified genera if they enter into the exclusion zone. In the final IHA this measure has been clarified and now states that if a delphinid from one of the specified genera is visually detected approaching the vessel (*i.e.*, to bow ride) or towed survey equipment, shutdown is not required. Furthermore, if there is uncertainty regarding identification of a marine mammal species (*i.e.*, whether the observed marine mammal(s) belongs to one of the delphinid genera for which shutdown is waived), PSOs must use best professional judgment in making the decision to call for a shutdown. If delphinids from the above genera are observed within or entering the relevant EZ but do not approach the vessel or towed survey equipment, shutdown is required. This revision emphasizes that the shutdown waiver only applies to specified delphinids when they are observed approaching a vessel.
- The proposed IHA indicated that a dedicated ASV PSO must be stationed on the bridge of the survey vessel and monitor the real-time picture from the thermal/HD camera installed on the front of the ASV, when it is in use. However, the proposed bridge monitoring screen may interfere with night vision capabilities of the captain and other crew working on the bridge. Therefore, as part of the final IHA the dedicated ASV PSO will monitor real-time video during nighttime operations and will usually be stationed near the ASV operator. During daytime surveys the dedicated ASV will be located on

the survey vessel in a position that provides a clear, unobstructed view of the ASV's exclusion and monitoring zones.

- In both the draft and final IHA, NMFS requires that independent observers must be utilized. In the final IHA, NMFS added that non-independent observers may be approved, on a case-by-case basis, for limited, specific duties in support of approved, independent PSOs. On smaller vessels engaged in shallow water surveys, limited space aboard the vessel may not allow for two or more PSOs. In that case, trained non-independent observers may take over if the lead PSOs needs to take a brief break (*e.g.* bathroom).

Description of Marine Mammals in the Area of the Specified Activity

Sections 3 and 4 of the application summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history, of the potentially affected species. Additional information regarding population trends and threats may be found in NMFS' Stock Assessment Reports (SAR; <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments>) and more general information about these species (*e.g.*, physical and behavioral descriptions) may be found on NMFS' website (<https://www.fisheries.noaa.gov/find-species>).

We expect that the species listed in Table 1 will potentially occur in the project area and will potentially be taken as a result of the planned project. Table 1 summarizes information related to the population or stock, including regulatory status under the MMPA and ESA and potential biological removal (PBR), where known. For taxonomy, we follow Committee on Taxonomy (2018). PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing

that stock to reach or maintain its optimum sustainable population (as described in NMFS' SARs). While no mortality is anticipated or authorized here, PBR is included here as a gross indicator of the status of the species and other threats.

Marine mammal abundance estimates presented in this document represent the total number of individuals that make up a given stock or the total number estimated within a particular study or survey area. NMFS' stock abundance estimates for most species represent the total estimate of individuals within the geographic area, if known, that comprise that stock. For some species, this geographic area may extend beyond U.S. waters. All managed stocks in this region are assessed in NMFS' U.S. Atlantic Ocean SARs (*e.g.*, Hayes *et al.*, 2019). All values presented in Table 1 are the most recent available at the time of publication and are available online at: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region>.

Table 1. Marine Mammal known to occur in Survey Area Waters

Common name	Scientific name	Stock	ESA/MMPA status; Strategic (Y/N) ¹	Stock abundance (CV, N _{min} , most recent abundance survey) ²	PBR	Annual M/SI ³
Order Cetartiodactyla – Cetacea – Superfamily Mysticeti (baleen whales)						
Family Balaenidae						
North Atlantic Right whale	<i>Eubalaena glacialis</i>	Western North Atlantic (WNA)	E/D; Y	451 (0; 445; 2017)	0.9	5.56
Family Balaenopteridae (rorquals)						
Humpback whale	<i>Megaptera novaeangliae</i>	Gulf of Maine	-/-; N	896 (0; 896; 2012)	14.6	9.7
Fin whale	<i>Balaenoptera physalus</i>	WNA	E/D; Y	1,618 (0.33; 1,234; 2011)	2.5	2.5
Sei whale	<i>Balaenoptera borealis</i>	Nova Scotia	E/D; Y	357 (0.52; 236)	0.5	0.8
Minke whale	<i>Balaenoptera acutorostrata</i>	Canadian East Coast	-/-; N	2,591 (0.81; 1,425)	14	7.7
Superfamily Odontoceti (toothed whales, dolphins, and porpoises)						
Family Physeteridae						

Sperm whale	<i>Physeter macrocephalus</i>	North Atlantic	E/D; Y	2,288 (0.28; 1,815)	3.6	0.8
Family Delphinidae						
Long-finned pilot whale	<i>Globicephala melas</i>	WNA	-/-; Y	5,636 (0.63; 3,464)	35	38
Bottlenose dolphin	<i>Tursiops spp.</i>	WNA Offshore	-/-; N	77,532 (0.40; 56053; 2016)	561	39.4
Short beaked common dolphin	<i>Delphinus delphis</i>	WNA	-/-; N	70,184 (0.28; 55,690;2011)	557	406
Atlantic white-sided dolphin	<i>Lagenorhynchus acutus</i>	WNA	-/-; N	48,819 (0.61; 30,403; 2011)	304	30
Atlantic spotted dolphin	<i>Stenella frontalis</i>	WNA	-/-; N	44,715 (0.43; 31,610; 2013)	316	0
Risso's dolphin	<i>Grampus griseus</i>	WNA	-/-; N	18,250 (0.5; 12,619; 2011)	126	49.7
Family Phocoenidae (porpoises)						
Harbor porpoise	<i>Phocoena phocoena</i>	Gulf of Maine/Bay of Fundy	-/-; N	79,833 (0.32; 61,415; 2011)	706	256
Order Carnivora – Superfamily Pinnipedia						
Family Phocidae (earless seals)						
Gray seal	<i>Halichoerus grypus</i>	-; N	27,131 (0.19; 23,158)	W. North Atlantic	1,389	5,688
Harbor seal	<i>Phoca vitulina</i>	-; N	75,834 (0.15; 66,884)	W. North Atlantic	345	333

1 - Endangered Species Act (ESA) status: Endangered (E), Threatened (T)/MMPA status: Depleted (D). A dash (-) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds PBR or which is determined to be declining and likely to be listed under the ESA within the foreseeable future. Any species or stock listed under the ESA is automatically designated under the MMPA as depleted and as a strategic stock.

2- NMFS marine mammal stock assessment reports online at: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region/>. CV is coefficient of variation; Nmin is the minimum estimate of stock abundance. In some cases, CV is not applicable

3 - These values, found in NMFS's SARs, represent annual levels of human-caused mortality plus serious injury from all sources combined (e.g., commercial fisheries, ship strike). Annual M/SI often cannot be determined precisely and is in some cases presented as a minimum value or range.

As described below, 15 species (with 15 managed stocks) temporally and spatially co-occur with the activity to the degree that take is reasonably likely to occur, which we have authorized. A detailed description of the of the species likely to be affected by planned HRG survey activities, including brief introductions to the species and relevant stocks as well as

available information regarding population trends and threats, and information regarding local occurrence, were provided in the **Federal Register** notice for the proposed IHA (84 FR 36054; July 26, 2019); since that time, we are not aware of any changes in the status of these species and stocks; therefore, detailed descriptions are not provided here. Please refer to that **Federal Register** notice for these descriptions.

Potential Effects of the Specified Activity on Marine Mammals and Their Habitat

The effects of underwater noise from Ørsted's survey activities have the potential to result in take of marine mammals by harassment in the vicinity of the survey area. The **Federal Register** notice for the proposed IHA (84 FR 36054; July 26, 2019) included a discussion of the effects of anthropogenic noise on marine mammals and their habitat, and that information is not repeated here. No instances of serious injury or mortality are expected as a result of the planned activities.

Estimated Take

This section provides an estimate of the number of incidental takes authorized through this IHA, which will inform both NMFS' consideration of "small numbers" and the negligible impact determination.

Harassment is the only type of take expected to result from these activities. Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).

Authorized takes would be by Level B harassment only, in the form of disruption of behavioral patterns for individual marine mammals resulting from exposure to sound from HRG equipment. Based on the nature of the activity and the anticipated effectiveness of the mitigation measures (*i.e.*, shutdown – discussed in detail below in Mitigation section), Level A harassment is neither anticipated nor authorized.

As described previously, no mortality is anticipated or authorized for this activity. Below we describe how the take is estimated.

Generally speaking, we estimate take by considering: (1) acoustic thresholds above which NMFS believes the best available science indicates marine mammals will be behaviorally harassed or incur some degree of permanent hearing impairment; (2) the area or volume of water that will be ensonified above these levels in a day; (3) the density or occurrence of marine mammals within these ensonified areas; and, (4) the number of days of activities. We note that while these basic factors can contribute to a basic calculation to provide an initial prediction of takes, additional information that can qualitatively inform take estimates is also sometimes available (*e.g.*, previous monitoring results or average group size). Below, we describe the factors considered here in more detail and present the take estimate.

Acoustic Thresholds

Using the best available science, NMFS has developed acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to be behaviorally harassed (equated to Level B harassment) or to incur PTS of some degree (equated to Level A harassment).

Level B Harassment for non-explosive sources – Though significantly driven by received level, the onset of behavioral disturbance from anthropogenic noise exposure is also informed to

varying degrees by other factors related to the source (*e.g.*, frequency, predictability, duty cycle), the environment (*e.g.*, bathymetry), and the receiving animals (hearing, motivation, experience, demography, behavioral context) and can be difficult to predict (Southall *et al.*, 2007, Ellison *et al.*, 2011). Based on what the available science indicates and the practical need to use a threshold based on a factor that is both predictable and measurable for most activities, NMFS uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment. NMFS predicts that marine mammals are likely to be behaviorally harassed in a manner we consider Level B harassment when exposed to underwater anthropogenic noise above received levels of 120 dB re 1 μ Pa (rms) for continuous (*e.g.* vibratory pile-driving, drilling) and above 160 dB re 1 μ Pa (rms) for non-explosive impulsive (*e.g.*, seismic airguns) or intermittent (*e.g.*, scientific sonar) sources. Ørsted's planned activities include the use of intermittent impulsive (HRG Equipment) sources, and therefore the 160 dB re 1 μ Pa (rms) threshold is applicable.

Level A harassment for non-explosive sources - NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Technical Guidance, 2018) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) as a result of exposure to noise from two different types of sources (impulsive or non-impulsive).

These thresholds are provided in Table 2 below. The references, analysis, and methodology used in the development of the thresholds are described in NMFS 2018 Technical Guidance, which may be accessed at: <http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm>.

Table 2. Thresholds identifying the onset of Permanent Threshold Shift.

	PTS Onset Acoustic Thresholds* (Received Level)	
Hearing Group	Impulsive	Non-impulsive
Low-Frequency (LF) Cetaceans	<i>Cell 1</i> $L_{pk,flat}$: 219 dB $L_{E,LF,24h}$: 183 dB	<i>Cell 2</i> $L_{E,LF,24h}$: 199 dB
Mid-Frequency (MF) Cetaceans	<i>Cell 3</i> $L_{pk,flat}$: 230 dB $L_{E,MF,24h}$: 185 dB	<i>Cell 4</i> $L_{E,MF,24h}$: 198 dB
High-Frequency (HF) Cetaceans	<i>Cell 5</i> $L_{pk,flat}$: 202 dB $L_{E,HF,24h}$: 155 dB	<i>Cell 6</i> $L_{E,HF,24h}$: 173 dB
Phocid Pinnipeds (PW) (Underwater)	<i>Cell 7</i> $L_{pk,flat}$: 218 dB $L_{E,PW,24h}$: 185 dB	<i>Cell 8</i> $L_{E,PW,24h}$: 201 dB
Otariid Pinnipeds (OW) (Underwater)	<i>Cell 9</i> $L_{pk,flat}$: 232 dB $L_{E,OW,24h}$: 203 dB	<i>Cell 10</i> $L_{E,OW,24h}$: 219 dB
<p>* Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered.</p> <p><u>Note:</u> Peak sound pressure (L_{pk}) has a reference value of 1 μPa, and cumulative sound exposure level (L_E) has a reference value of 1 μPa²s. In this Table, thresholds are abbreviated to reflect American National Standards Institute standards (ANSI 2013). However, peak sound pressure is defined by ANSI as incorporating frequency weighting, which is not the intent for this Technical Guidance. Hence, the subscript “flat” is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (<i>i.e.</i>, varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these acoustic thresholds will be exceeded.</p>		

Ensonified Area

Here, we describe operational and environmental parameters of the activity that will feed into identifying the area ensonified above the acoustic thresholds, which include source levels and transmission loss coefficient.

When NMFS’ Acoustic Technical Guidance (2016) was published, in recognition of the fact that ensonified area/volume could be more technically challenging to predict because of the duration component of the new thresholds, NMFS developed an optional User Spreadsheet that

includes tools to help predict takes. We note that because of some of the assumptions included in the methods used for these tools, we anticipate that isopleths produced are typically going to be overestimates of some degree, which will result in some degree of overestimate of Level A take. However, these tools offer the best way to predict appropriate isopleths when more sophisticated 3D modeling methods are not available, and NMFS continues to develop ways to quantitatively refine these tools, and will qualitatively address the output where appropriate. For mobile sources such as the HRG survey equipment planned for use in Ørsted's activity, the User Spreadsheet predicts the closest distance at which a stationary animal would not incur PTS if the sound source traveled by the animal in a straight line at a constant speed.

Ørsted conducted field verification tests on different types of HRG equipment within the planned Lease Areas during previous site characterization survey activities. NMFS is proposing to authorize take in these same three Lease Areas listed below.

- *OCS-A 0486 & OCS-A 0487*: Marine Acoustics, Inc. (MAI), under contract to Oceaneering International completed an underwater noise monitoring program for the field verification for equipment to be used to survey the Skipjack Windfarm Project (MAI 2018a; 2018b).
- *OCS-A 0500 Lease Area*: The Gardline Group (Gardline), under contract to Alpine Ocean Seismic Survey, Inc., completed an underwater noise monitoring program for the field verification within the Lease Area prior to the commencement of the HRG survey which took place between August 14 and October 6, 2016 (Gardline 2016a, 2016b, 2017). Additional field verifications were completed by the RPS Group, under contract to Terrasond prior to commencement of the 2018 HRG field survey campaign (RPS 2018).

Field Verification results are shown in Table 3. The purpose of the field verification programs was to determine distances to the regulatory thresholds for injury/mortality and behavior disturbance of marine mammals that were established during the permitting process.

As part of their application, Ørsted collected field verified source levels and calculated the differential between the averaged measured field verified source levels versus manufacturers' reported source levels for each tested piece of HRG equipment. The results of the field verification studies were used to derive the variability in source levels based on the extrapolated values resulting from regression analysis. These values were used to further calibrate calculations for a specific suite of HRG equipment of similar type. Ørsted stated that the calculated differential accounts for both the site specific environmental conditions and directional beam width patterns and can be applied to similar HRG equipment within one of the specified equipment categories (*e.g.* USBL & GAPS Transceivers, Shallow Sub-Bottom Profilers (SBP), Parametric SBP, Medium Penetration SBP (Sparker), and Medium Penetration SBP (Boomer)). For example, the manufacturer of the Geosource 800J medium penetration SBP reported a source level of 206 dB RMS. The field verification study measured a source level of 189 dB RMS (Gardline 2016a, 2017). Therefore, the differential between the manufacturer and field verified SL is -17 dB RMS. Ørsted planned to apply this differential (-17 dB) to other HRG equipment in the medium penetration SBP (sparker) category with an output of approximately 800 joules. Ørsted employed this methodology for all non-field verified equipment within a specific equipment category. These new differential-based proxy SLs were inserted into the User Spreadsheet and used to calculate the Level A and Level B harassment isopleths for the various hearing groups. Table 3 shows the field verified equipment SSV results as well as applicable non-verified equipment broken out by equipment category.

Table 3. Summary of Field Verified HRG Equipment SSV results and Applicable HRG Devices Grouped by Category Type.

Representative HRG Survey Equipment	Operating Frequencies	Baseline Source Level (dB re 1 μ Pa)	Source Level Measured During Ørsted FV Surveys (dB re 1 μ Pa)	2019 HRG Survey Data Acquisition Equipment
USBL & GAPS Transponder and Transceiver ^{a/}				
Sonardyne Ranger 2	19 to 34 kHz	200 dB _{RMS}	166 dB _{RMS}	Sonardyne Ranger 2 USBL HPT 5/7000 Sonardyne Ranger 2 USBL HPT 3000 Sonardyne Scout Pro Easytrak Nexus 2 USBL IxSea GAPS System Kongsberg HiPAP 501/502 USBL Edgetech BATS II
Shallow Sub-Bottom Profilers (Chirp) ^{a/c/}				
GeoPulse 5430 A Sub-bottom Profiler	1.5 to 18 kHz	214 dB _{RMS}	173 dB _{RMS}	Edgetech 3200 Teledyne Benthos Chirp III - TTV 170
EdgeTech 512	0.5 to 12 kHz	177 dB _{RMS}	166 dB _{RMS}	PanGeo LF Chirp PanGeo HF Chirp EdgeTech 216 EdgeTech 424
Parametric Sub-Bottom Profiler ^{d/}				
Innomar SES-2000 Medium 100	85 to 115	247 dB _{RMS}	187 dB _{RMS}	Innomar SES-2000 Standard & Plus Innomar SES-2000 Medium 70 Innomar SES-2000 Quattro PanGeo 2i Parametric
Medium Penetration Sub-Bottom Profiler (Sparker) ^{a/}				
Geo-Resources Geo-Source 600 J	0.05 to 5 kHz	214 dB _{Peak} 205 dB _{RMS}	206 dB _{Peak} 183 dB _{RMS}	GeoMarine Geo-Source 400tip Applied Acoustics Dura-Spark 400 System
Geo-Resources Geo-Source 800 J	0.05 to 5 kHz	215 dB _{Peak} 206 dB _{RMS}	212 dB _{Peak} 189 dB _{RMS}	GeoMarine Geo-Source 800
Medium Penetration Sub-Bottom Profiler (Boomer) ^{b/c}				
Applied Acoustics S-Boom Triple Plate Boomer (700J)	0.1 to 5	211 dB _{Peak} 205 dB _{RMS}	195 dB _{Peak} 173 dB _{RMS}	Not used for any other equipment
Applied Acoustics S-Boom Triple Plate Boomer (1000J)	0.250 to 8 kHz	228 dB _{Peak} 208 dB _{RMS}	215 dB _{Peak} 198 dB _{RMS}	Not used for any other equipment
Note: Sources: ^{a/} Gardline 2016a, 2017; ^{b/} RPS 2018; ^{c/} MAI 2018a; ^{d/} Subacoustech 2018				

After careful consideration, NMFS concluded that the use of differentials to derive proxy SLs is not appropriate or acceptable. NMFS determined that when field verified measurements are compared to the source levels measured in a controlled experimental setting (*i.e.*, Crocker and Fratantonio, 2016), there are significant discrepancies in isopleth distances for the same equipment that cannot be explained solely by absorption and scattering of acoustic energy. There are a number of variables, including potential differences in propagation rate, operating frequency, beam width, and pulse width that make us question whether SL differential values can be universally applied across different pieces of equipment, even if they fall within the same equipment category. Therefore, NMFS did not employ Ørsted's planned use of differentials to determine Level A and Level B harassment isopleths or take estimates.

As noted above, much of the HRG equipment planned for use during Ørsted's survey has not been field-verified. NMFS employed an alternate approach in which data reported by Crocker and Fratantonio (2016) was used to establish injury and behavioral harassment zones. If Crocker and Fratantonio (2016) did not provide data on a specific piece of equipment within a given equipment category, the SLs reported in the study for measured equipment are used to represent all the other equipment within that category, regardless of whether any of the devices has been field verified. If SSV data from Crocker and Fratantonio (2016) is not available across an entire equipment category, NMFS instead adopted the field verified results from equipment that had been tested. Here, the largest field verified SL was used to represent the entire equipment category. These values were applied to the User Spreadsheet to calculate distances for each of the planned HRG equipment categories that might result in harassment of marine mammals. Inputs to the User Spreadsheet are shown in Table 4. The source levels used in Table

4 are from field verified values shown in Table 3. However, source levels for the EdgeTech 512 (177 dB RMS) and Applied Acoustics S-Boom Triple Plate Boomer (1,000j) (203 dB RMS) were derived from Crocker and Fratantonio (2016). Table 7 depicts isopleths that could result in injury to a specific hearing group.

Table 4. Inputs to the User Spreadsheet.

Spreadsheet Tab Used	USBL	Shallow Penetration SBP-Chirp	Shallow Penetration SBP-Chirp	Parametric SBP	Medium Penetration SBP - Sparker	Medium Penetration SBP - Boomer
	D: MOBILE SOURCE: Non-Impulsive, Intermittent	D: MOBILE SOURCE: Non-Impulsive, Intermittent	D: MOBILE SOURCE: Non-Impulsive, Intermittent	D: MOBILE SOURCE: Non-Impulsive, Intermittent	F: MOBILE SOURCE: Impulsive, Intermittent	F: MOBILE SOURCE: Impulsive, Intermittent
HRG Equipment	Sonardyne Ranger 2	GeoPulse 5430 A Sub-bottom Profiler	EdgeTech 512	Innomar SES 2000 Medium 100	GeoMarine Geo-Source 800 J	Applied Acoustics S-Boom Triple Plate Boomer (1,000j)
Source Level (dB RMS SPL)	166	173	177*	187	212 Pk 189 RMS	209 Pk 203 RMS*
Weighting Factor Adjustment (kHz)	26	4.5	3	42	2	0.6
Source Velocity (m/s)	2.045	2.045	2.045	2.045	2.045	2.045
Pulse Duration (seconds)	0.3	0.025	0.0022	0.001	0.055	0.0006
1/Repetition rate^ (seconds)	1	0.1	0.50	0.025	0.5	0.333
Source Level (PK SPL)	---	---	---	--	212	215
Propagation (xLogR)	20	20	20	20	20	20

* Crocker and Fratantonio (2016)

Table 5. Maximum Distances to Level A Harassment Isopleths Based on Data from Field Verification studies and Crocker and Fratantonio (2016) (where available).

Representative HRG Survey Equipment	Marine Mammal Group	PTS Onset	Lateral Distance (m)
USBL/GAPS Positioning Systems			

Sonardyne Ranger 2	LF cetaceans	199 dB SEL _{cum}	---
	MF cetaceans	198 dB SEL _{cum}	---
	HF cetaceans	173 dB SEL _{cum}	< 1
	Phocid pinnipeds	201 dB SEL _{cum}	---
Shallow Sub-Bottom Profiler (Chirp)			
Edgetech 512	LF cetaceans	199 dB SEL _{cum}	---
	MF cetaceans	198 dB SEL _{cum}	---
	HF cetaceans	173 dB SEL _{cum}	---
	Phocid pinnipeds	201 dB SEL _{cum}	---
GeoPulse 5430 A Sub-bottom Profiler	LF cetaceans	199 dB SEL _{cum}	---
	MF cetaceans	198 dB SEL _{cum}	---
	HF cetaceans	173 dB SEL _{cum}	---
	Phocid pinnipeds	201 dB SEL _{cum}	---
Parametric Sub-bottom Profiler			
Innomar SES-2000 Medium 100	LF cetaceans	199 dB SEL _{cum}	---
	MF cetaceans	198 dB SEL _{cum}	---
	HF cetaceans	173 dB SEL _{cum}	<2
	Phocid pinnipeds	201 dB SEL _{cum}	---
Medium Penetration Sub-Bottom Profiler (Sparker)			
GeoMarine Geo-Source 800tip	LF cetaceans	219 dBpeak, 183 dB SEL _{cum}	---, < 1
	MF cetaceans	230 dBpeak, 185 dB SEL _{cum}	---, ---
	HF cetaceans	202 dBpeak, 155 dB SEL _{cum}	<4, <1
	Phocid pinnipeds	218 dBpeak, 185 dB SEL _{cum}	---, <1
Medium Penetration Sub-Bottom Profiler (Boomer)			
Applied Acoustics S-Boom Triple Plate Boomer (1000j)	LF cetaceans	219 dBpeak, 183 dB SEL _{cum}	---, < 1
	MF cetaceans	230 dBpeak, 185 dB SEL _{cum}	---, ---
	HF cetaceans	202 dBpeak, 155 dB SEL _{cum}	< 3, --
	Phocid pinnipeds	218 dBpeak, 185 dB SEL _{cum}	---, ---

In the absence of Crocker and Fratantonio (2016) data, as noted above, NMFS determined that field verified SLs could be used to delineate Level A harassment isopleths which can be used to represent all of the HRG equipment within that specific category. While there is some uncertainty given that the SLs associated with assorted HRG equipment are variable within a given category, all of the predicted distances based on the field-verified source level are small enough to support a prediction that Level A harassment is unlikely to occur. While it is possible that Level A harassment isopleths of non-verified equipment would be larger than those shown in Table 5, it is unlikely that such zones would be substantially greater in size such that take by Level A harassment would be expected. Therefore, NMFS is not proposing to authorize any take from Level A harassment.

The methodology described above was also applied to calculate Level B harassment isopleths as shown in Table 6. Note that the spherical spreading propagation model ($20\log R$) was used to derive behavioral harassment isopleths for equipment measured by Crocker and Fratantonio (2016) data. However, the practical spreading model ($15\log R$) was used to conservatively assess distances to Level B harassment thresholds for equipment not tested by Crocker and Fratantonio (2016). Table 6 shows calculated Level B harassment isopleths for specific equipment tested by Crocker and Fratantonio (2016) which is applied to all devices within a given category. In cases where Crocker and Fratantonio (2016) collected measurement on more than one device, the largest calculated isopleth is used to represent the entire category. Table 6 also shows field-verified SLs and associated Level B harassment isopleths for equipment categories that lack relevant Crocker & Fratantonio (2016) measurements. Additionally, Table 6 also references the specific field verification studies that were used to develop the isopleths. For

these categories, the largest calculated isopleth in each category was also used to represent all equipment within that category.

Further information depicting how Level B harassment isopleths were derived for each equipment category is described below:

USBL and GAPS: There are no relevant information sources or measurement data within the Crocker and Fratantonio (2016) report. However, SSV tests were conducted on the Sonardyne Ranger 2 (Gardline 2016a, 2017) and the IxSea GAPS System (MAI 2018b). Of the two devices, the IxSea GAPS System had the larger Level B harassment isopleth calculated at a distance of 6 m. It is assumed that all equipment within this category will have the same Level B harassment isopleth.

Parametric SBP: There are no relevant data contained in Crocker and Fratantonio (2016) report for parametric SBPs. However, results from an SSV study showed a Level B harassment isopleth of 63 m for the Innomar-2000 SES Medium 100 system (Subacoustech 2018). Therefore, 63 m will serve as the Level B harassment isopleth for all parametric SBP devices.

SBP (Chirp): Crocker and Fratantonio (2016) tested two chirpers, the Edge Tech (ET) models 424 and 512. The largest calculated isopleth is 7 m associated with the Edgetech 512. This distance will be applied to all other HRD equipment within this category.

SBP (sparkers): The Applied Acoustics Dura-Spark 400 was the only sparker tested by Crocker and Fratantonio (2016). The Level B harassment isopleth calculated for this device is 141 m and represents all equipment within this category.

SBP (Boomers): The Crocker and Fratantonio report (2016) included data on the Applied Acoustics S-Boom Triple Plate Boomer (1,000J) and the Applied Acoustics S-Boom Boomer (700J). The results showed respective Level B harassment isopleths of 141 m and 178 m.

Therefore, the Level B harassment isopleth for both boomers will be established at a distance of 178 m.

Table 6: Distances to Level B harassment Isopleths.

HRG Survey Equipment	Lateral Distance to Level B (m)	Measured SSV Level at Closest Point of Approach Single Pulse $SPL_{rms,90\%}$ (dB re $1\mu Pa^2$)
USBL & GAPS Transceiver		
Sonardyne Ranger 2 ^{a/}	2	126 to 132 @ 40 m
Sonardyne Scout Pro	--	N/A
Easytrak Nexus 2 USBL	--	N/A
IxSea GAPS System ^{a/}	6	144 @ 35 m
Kongsberg HiPAP 501/502 USBL	--	N/A
Edgetech BATS II	--	N/A
Shallow Sub-Bottom Profiler (Chirp)		
Edgetech 3200 ^{f/}	5	153 @ 30 m
EdgeTech 216 ^{a/}	2	142 @ 35 m
EdgeTech 424	6	Crocker and Fratantonio (2016): SL = 176
EdgeTech 512 c/ [/]	2.4	141 dB @ 40 m 130 dB @ 200 m
	7	Crocker and Fratantonio (2016): SL = 177
Teledyne Benthos Chirp III - TTV 170	--	N/A
GeoPulse 5430 A Sub-Bottom Profiler ^{a/}	4	145 @ 20 m
PanGeo LF Chirp (Corer)	--	N/A
PanGeo HF Chirp (Corer)	--	N/A
Parametric Sub-Bottom Profiler		
Innomar SES-2000 Medium 100 Parametric Sub-Bottom Profiler ^{b/}	63	129 to 133 @ 100 m
Innomar SES-2000 Medium 70 Parametric Sub-Bottom Profiler	--	N/A

Innomar SES-2000 Standard & Plus Parametric Sub-Bottom Profiler	--	N/A
Innomar SES-2000 Quattro	--	N/A
PanGeo 2i Parametric (Corer)	--	N/A
Medium Penetration Sub-Bottom Profiler (Sparker)		
GeoMarine Geo-Source 400tip	--	N/A
GeoMarine Geo-Source 600tip ^{a/}	34	155 @ 20 m
GeoMarine Geo-Source 800tip ^{a/}	86	144 @ 200 m
Applied Acoustics Dura-Spark 400 System ^{g/}	141	Crocker and Fratantonio (2016); SL = 203
GeoResources Sparker 800 System	--	N/A
Medium Penetration Sub-Bottom Profiler (Boomer)		
Applied Acoustics S-Boom Boomer 1000 J operation ^{d,g/}	20	146@144
	141	Crocker and Fratantonio (2016); SL = 203
Applied Acoustics S-Boom Boomer/ 700 J operation ^{d,g/}	14	142 @ 38 m
	178	Crocker and Fratantonio (2016); SL = 205
Sources: ^{a/} Gardline 2016a, 2017 ^{b/} Subacoustech 2018, ^{c/} MAI 2018a, ^{d/} NCE, 2018 ^{e/} MAI 2018b, ^{f/} Subacoustech 2017, ^{g/} Crocker and Fratantonio, 2016.		

For the purposes of estimated take and implementing required mitigation measure, it is assumed that all HRG equipment will operate concurrently. Therefore, NMFS conservatively utilized the largest isopleth of 178 m, derived from the Applied Acoustics S-Boom Boomer medium SBP, to establish the Level B harassment zone for all HRG categories and devices.

Take Calculation and Estimation

Here we describe how the information provided above is brought together to produce a quantitative take estimate. In order to estimate the number of marine mammals predicted to be exposed to sound levels that would result in harassment, radial distances to predicted isopleths corresponding to harassment thresholds are calculated, as described above. Those distances are then used to calculate the area(s) around the HRG survey equipment predicted to be ensonified to sound levels that exceed harassment thresholds. The area estimated to be ensonified to relevant thresholds by a single vessel in a single day of the survey is then calculated, based on areas predicted to be ensonified around the HRG survey equipment and the estimated trackline distance traveled per day by the survey vessel. The daily area is multiplied by the marine mammal density of a given species. This value is then multiplied by the number of planned vessel days (666).

HRG survey equipment has the potential to cause harassment as defined by the MMPA (160 dB_{RMS} re 1 μ Pa). As noted previously, all noise producing survey equipment/sources are assumed to be operated concurrently by each survey vessel on every vessel day. The greatest distance to the Level B harassment threshold of 160 dB_{RMS90%} re 1 μ Pa level B for impulsive sources is 178 m associated with the Applied Acoustics S-Boom Boomer (700J) (Crocker & Fratantonio, 2016) under the assumption that sound emitted from the device is omnidirectional . Therefore, this distance is conservatively used to estimate take by Level B harassment.

The estimated distance of the daily vessel trackline was determined using the estimated average speed of the vessel and the 24-hour operational period within each of the corresponding survey segments. Estimates of incidental take by HRG survey equipment are calculated using the 178 m Level B harassment isopleth, estimated daily vessel track of approximately 70 km, and

the daily ensonified area of 25.022 km² for 24-hour operations as shown in Table 7, multiplied by 666 days.

Table 7. Survey Segment Distances and Level B harassment Isopleth and Zone

Survey Segment	Number of Active Survey Vessel Days	Estimated distances per day (km)	Level Harassment Isopleth (m)	Calculated ZOI per day (km ²)
Lease Area OCS-A 0486	79	70.000	178	25.022
Lease Area OCS-A 0487	140			
Lease Area OCS-A 0500	94			
ECR Corridor(s)	353			

The data used as the basis for estimating species density for the Lease Area are derived from data provided by Duke Universities' Marine Geospatial Ecology Lab and the Marine-life Data and Analysis Team. This data set is a compilation of the best available marine mammal data (1994-2018) and was prepared in a collaboration between Duke University, Northeast Regional Planning Body, University of Carolina, the Virginia Aquarium and Marine Science Center, and NOAA (Roberts *et al.*, 2016a; Curtice *et al.* 2018). Recently, these data have been updated with new modeling results and have included density estimates for pinnipeds (Roberts *et al.*, 2016b; 2017; 2018). Because the seasonality of, and habitat use by, gray seals roughly overlaps with harbor seals, the same abundance estimate is applicable. Pinniped density data (as presented in Roberts *et al.* 2016b; 2017; 2018) were used to estimate pinniped densities for the Lease Area Survey segment and ECR Corridor Survey segment(s). Density data from Roberts *et al.* (2016b; 2017; 2018) were mapped within the boundary of the survey area for each segment using geographic information systems. For all survey area locations, the maximum densities as reported by Roberts *et al.* (2016b; 2017; 2018), were averaged over the survey duration (for spring, summer, fall and winter) for the entire HRG survey area based on the planned HRG

survey schedule as depicted in Table 7. The Level B ensonified area and the projected duration of each respective survey segment was used to produce the estimated take calculations provided in Table 8.

Table 8. Marine Mammal Density and Estimated Level B Harassment Take Numbers at 178 m Isopleth.

Species	Lease Area OCS-A 0500		Lease Area OCS-A 0486		Lease Area OCS-A 0487		ECR Corridor(s)		Adjusted Totals	
	Average Seasonal Density ^{a/} (No./100 km ²)	Calculated Take (No.)	Average Seasonal Density ^{a/} (No./100 km ²)	Calculated Take (No.)	Average Seasonal Density ^{a/} (No./100 km ²)	Calculated Take (No.)	Average Seasonal Density ^{a/} (No./100 km ²)	Calculated Take (No.)	Take Authorization (No.)	Percent of Population
North Atlantic right whale	0.502	11.798	0.383	7.570	0.379	13.262	0.759	67.029	10 ^{c/}	2.2
Humpback whale	0.290	6.814	0.271	5.354	0.277	9.717	0.402	35.537	58	6.4
Fin whale	0.350	8.221	0.210	4.157	0.283	9.929	0.339	29.905	52	3.2
Sei whale	0.014	0.327	0.005	0.106	0.009	0.306	0.011	0.946	2	0.5
Sperm whale	0.018	0.416	0.014	0.272	0.017	0.581	0.047	4.118	5	0.2
Minke whale	0.122	2.866	0.075	1.487	0.094	3.275	0.126	11.146	19	0.7
Long-finned pilot whale	1.895	44.571	0.504	9.969	1.012	35.449	1.637	144.590	235	4.2
Bottlenose dolphin	1.992	46.844	1.492	57.800	1.478	43.874	25.002	2,208.314	2,357	3.0
Short beaked common dolphin	22.499	529.176	7.943	157.012	14.546	509.559	19.198	1,695.655	2,892	4.1
Atlantic white-sided dolphin	7.349	172.857	2.006	39.656	3.366	117.896	7.634	674.282	1,005	2.1
Spotted dolphin	0.105	2.477	2.924	0.313	1.252	1.119	0.109	9.611	50 ^{d/}	0.1
Risso's dolphin	0.037	0.859	0.016	0.120	0.032	0.498	0.037	3.291	30 ^{d/}	0.2
Harbor porpoise	5.389	126.757	5.868	115.997	4.546	159.253	20.098	1,775.180	2,177	<0.1
Harbor seal ^{b/}	7.633	179.522	6.757	133.558	3.966	138.918	45.934	4,057.192	4,509	5.9
Gray Seal ^{b/}	7.633	179.522	6.757	133.558	3.966	138.918	45.934	4,057.192	4,509	16.6

Notes:

a/ Cetacean density values from Duke University (Roberts *et al.* 2016b, 2017, 2018)

b/ Pinniped density values from Duke University (Roberts *et al.* 2016, 2017, 2018) reported as "seals" and not species-specific

c/ Exclusion zone exceeds Level B isopleth; take adjusted to 10 given duration of survey

d/ The number of authorized takes (Level B harassment only) for these species has been increased from the estimated take to mean group size. Source for Atlantic spotted dolphin group size estimate is: Jefferson *et al.* (2008). Source for Risso's dolphin group size estimate is: Baird and Stacey (1991).

For the North Atlantic right whale, NMFS proposes to establish a 500-m EZ which substantially exceeds the distance to the level B harassment isopleth (178 m). However, Ørsted will be operating 24 hours per day for a total of 666 vessel days. Even with the implementation of mitigation measures (including night-vision goggles and thermal clip-ons) it is reasonable to assume that night time operations for an extended period could result in a limited number of right whales being exposed to underwater sound at Level B harassment levels. Given the fact that take has been conservatively calculated based on the largest source, which will not be operating at all times, and is thereby likely over-estimated to some degree, the fact that Ørsted will implement a shutdown zone at least 1.5 times the predicted Level B threshold distance (see below) for that largest source (and significantly more than that for the smaller sources), and the fact that night vision goggles with thermal clips will be used for nighttime operations, NMFS predicts that 10 right whales may be taken by Level B harassment.

Note that the 178-m Level B harassment isopleth associated with the Acoustics S-Boom Boomer was utilized to calculate take for the proposed IHA. This is highly conservative as it was assumed in the proposed IHA that sound emitted by all HRG equipment is omnidirectional. However, The Applied Acoustics S-Boom Boomer actually features a defined downward focused beam width angle of 80 degrees. When this beam width is taken into consideration the Level B harassment isopleth is 64 m when the survey vessel is operating in waters with a maximum depth of 77 m. Therefore, the largest omnidirectional Level B harassment isopleth is associated with the Applied Acoustics Dura-Spark 400 System, which has a 141-m isopleth for Level B harassment. This device will be used for a maximum of 134 days out of 666 vessel days (~20 percent). We determined that the largest actual Level B harassment isopleth is more

accurately estimated at a maximum of 141 m, and will be used on only 20 percent of vessel days. The next largest Level B isopleth is the GeoMarine Geo-Source 800tip which has a Level B harassment isopleth of 86 m. This device will be used for a maximum of 125 days. The remaining 273 days will utilize various HRG devices with Level B harassment isopleths ranging 63 m (Innomar SES-2000 Medium 100 Parametric Sub-Bottom Profiler) to 6 m (EdgeTech 424 sub-bottom profiler). . When take is calculated by incorporating isopleths of 141 m or less, total calculated take of right whales (without consideration of mitigation) by Level B harassment is reduced from 100 to 47 takes.

Additionally, sightings of right whales have been uncommon during previous HRG surveys. Bay State Wind submitted a marine mammal monitoring report HRG survey on July 19, 2019 described PSO observations and takes in Lease Area OCS-A500, which is part of the survey area covered under this IHA as well as along several ECR corridors closer to shore. Over 376 vessel days, three separate survey ships recorded a total of 496 marine mammal detections between May 11, 2018 and March 14, 2019. NMFS acknowledges that this monitoring span excludes a portion of the higher-density period defined by NMFS for this IHA (March-June). Nevertheless, there were no confirmed observations of right whales on any of the survey ships during the entire survey period. There were a number of unidentifiable whales reported, and it is possible that some of these unidentified animals may have been right whales. However, the lack of confirmed observations indicates that right whale sightings are not common in this region. In summary, given the low observation rate, expected efficacy of the required mitigation measures, and our revised calculated take numbers, we believe that the authorization of ten right whale takes by Level B harassment is reasonable.

Mitigation

In order to issue an IHA under Section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to such activity, and other means of effecting the least practicable impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stock for taking for certain subsistence uses (latter not applicable for this action). NMFS regulations require applicants for incidental take authorizations to include information about the availability and feasibility (economic and technological) of equipment, methods, and manner of conducting such activity or other means of effecting the least practicable adverse impact upon the affected species or stocks and their habitat (50 CFR 216.104(a)(11)).

In evaluating how mitigation may or may not be appropriate to ensure the least practicable adverse impact on species or stocks and their habitat, as well as subsistence uses where applicable, we carefully consider two primary factors:

1) The manner in which, and the degree to which, the successful implementation of the measure(s) is expected to reduce impacts to marine mammals, marine mammal species or stocks, and their habitat. This considers the nature of the potential adverse impact being mitigated (likelihood, scope, range). It further considers the likelihood that the measure will be effective if implemented (probability of accomplishing the mitigating result if implemented as planned) and the likelihood of effective implementation (probability implemented as planned); and

2) The practicability of the measures for applicant implementation, which may consider such things as cost, impact on operations, and, in the case of a military readiness activity, personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

The required mitigation measures outlined in this section are based on protocols and procedures that are expected to reduce the number or intensity of takes and have been successfully and practicably implemented in the past (DONG Energy, 2016, ESS, 2013; Dominion, 2013 and 2014). Ørsted is required to abide by the following measures, which have been modified slightly from the proposed IHA as described in the Changes section.

Ørsted will develop an environmental training program that will be provided to all vessel crew prior to the start of survey and during any changes in crew such that all survey personnel are fully aware and understand the mitigation, monitoring and reporting requirements. Prior to implementation, the training program will be provided to NOAA Fisheries for review and approval. Confirmation of the training and understanding of the requirements will be documented on a training course log sheet. Signing the log sheet will certify that the crew members understand and will comply with the necessary requirements throughout the survey event.

Marine Mammal Monitoring zone, Harassment Zone and Exclusion Zone

PSOs will observe the following monitoring and exclusion zones for the presence of marine mammals:

- 500-m exclusion zone for North Atlantic right whales;
- 100-m exclusion zone for all marine mammals (except North Atlantic right whales); and
- 180-m Level B harassment zone for all marine mammals except for North Atlantic right whales. This represents the largest Level B harassment isopleth applicable to all hearing groups. Animals observed entering into the Level B harassment zone will be recorded as Level B takes.

If a marine mammal is detected approaching or entering the exclusion zones during the HRG survey, the vessel operator would adhere to the shutdown procedures described below to minimize noise impacts on the animals.

At all times, the vessel operator will maintain a separation distance of 500 m from any sighted North Atlantic right whale as stipulated in the *Vessel Strike Avoidance* procedures described below. These stated requirements will be included in the site-specific training to be provided to the survey team.

Pre-Clearance of the Exclusion Zones

Ørsted will implement a 30-minute clearance period of the exclusion zones prior to the initiation of ramp-up. During this period the exclusion zones will be monitored by the PSOs, using the appropriate visual technology for a 30-minute period. Ramp up may not be initiated if any marine mammal(s) is within its respective exclusion zone. If a marine mammal is observed within an exclusion zone during the pre-clearance period, ramp-up may not begin until the animal(s) has been observed exiting its respective exclusion zone or until an additional time period has elapsed with no further sighting (*i.e.*, 15 minutes for small odontocetes/seals, 30 minutes for all other species).

Ramp-Up

A ramp-up procedure will be used for HRG survey equipment capable of adjusting energy levels at the start or re-start of HRG survey activities. A ramp-up procedure will be used at the beginning of HRG survey activities in order to provide additional protection to marine mammals near the survey area by allowing them to vacate the area prior to the commencement of survey equipment use. The ramp-up procedure will not be initiated during periods of inclement

conditions or if the exclusion zones cannot be adequately monitored by the PSOs, using the appropriate visual technology for a 30-minute period

A ramp-up would begin with the powering up of the smallest acoustic HRG equipment at its lowest practical power output appropriate for the survey. When technically feasible the power would then be gradually turned up and other acoustic sources would be added.

Ramp-up activities will be delayed if a marine mammal(s) enters its respective exclusion zone. Ramp-up will continue if the animal has been observed exiting its respective exclusion zone or until an additional time period has elapsed with no further sighting (*i.e.*, 15 minutes for small odontocetes/seals and 30 minutes for all other species).

Shutdown Procedures

An immediate shut-down of the HRG survey equipment will be required if a marine mammal is sighted at or within its respective exclusion zone. The vessel operator must comply immediately with any call for shut-down by the Lead PSO. Any disagreement between the Lead PSO and vessel operator should be discussed only after shut-down has occurred. Subsequent restart of the survey equipment can be initiated if the animal has been observed exiting its respective exclusion zone with 30 minutes of the shut-down or until an additional time period has elapsed with no further sighting (*i.e.*, 15 minutes for small odontocetes/seals and 30 minutes for all other species).

If a species for which authorization has not been granted, or, a species for which authorization has been granted but the authorized number of takes have been met, approaches or is observed within the 180 m Level B harassment zone, shutdown must occur.

If the acoustic source is shut down for reasons other than mitigation (*e.g.*, mechanical difficulty) for less than 30 minutes, it may be activated again without ramp-up, if PSOs have

maintained constant observation and no detections of any marine mammal have occurred within the respective exclusion zones. If the acoustic source is shut down for a period longer than 30 minutes and PSOs have maintained constant observation then ramp-up procedures will be initiated as described in previous section.

The shutdown requirement is waived for small delphinids of the following genera: *Delphinus*, *Lagenorhynchus*, *Stenella*, and *Tursiops*. Specifically if a delphinid(s) from the specified genera is visually detected approaching the vessel (*i.e.*, to bow ride) or towed survey equipment, shutdown is not required. If there is uncertainty regarding identification of a marine mammal species (*i.e.*, whether the observed marine mammal(s) belongs to one of the genera for which shutdown is waived), PSOs must use best professional judgment in making the decision to call for a shutdown. However, if delphinids from the above genera are observed within or entering the relevant EZ but do not approach the vessel or towed survey equipment, shutdown is required. Additionally, shutdown is required if a delphinid is detected in the exclusion zone and belongs to a genus other than those specified.

Vessel Strike Avoidance

Ørsted will ensure that vessel operators and crew maintain a vigilant watch for cetaceans and pinnipeds and slow down or stop their vessels to avoid striking these species. Survey vessel crew members responsible for navigation duties will receive site-specific training on marine mammal and sea turtle sighting/reporting and vessel strike avoidance measures. Vessel strike avoidance measures will include the following, except under extraordinary circumstances when complying with these requirements would put the safety of the vessel or crew at risk:

- All vessel operators will comply with 10 knot (<18.5 km per hour [km/h]) speed restrictions in any Dynamic Management Area (DMA) when in effect and in Mid-Atlantic Seasonal Management Areas (SMA) from November 1 through April 30;
- All vessel operators will reduce vessel speed to 10 knots or less when mother/calf pairs, pods, or larger assemblages of non-delphinoid cetaceans are observed near an underway vessel;
- All survey vessels will maintain a separation distance of 1,640 ft (500 m) or greater from any sighted North Atlantic right whale;
- If underway, vessels must steer a course away from any sighted North Atlantic right whale at 10 knots (<18.5 km/h) or less until the 1,640-ft (500-m) minimum separation distance has been established. If a North Atlantic right whale is sighted in a vessel's path, or within 330 ft (100 m) to an underway vessel, the underway vessel must reduce speed and shift the engine to neutral. Engines will not be engaged until the North Atlantic right whale has moved outside of the vessel's path and beyond 330 ft (100 m). If stationary, the vessel must not engage engines until the North Atlantic right whale has moved beyond 330 ft (100 m);
- All vessels will maintain a separation distance of 330 ft (100 m) or greater from any sighted non-delphinoid (*i.e.*, mysticetes and sperm whales) cetaceans. If sighted, the vessel underway must reduce speed and shift the engine to neutral, and must not engage the engines until the non-delphinoid cetacean has moved outside of the vessel's path and beyond 330 ft (100 m). If a survey vessel is stationary, the vessel will not engage engines until the non-delphinoid cetacean has moved out of the vessel's path and beyond 330 ft (100 m);
- All vessels will maintain a separation distance of 164 ft (50 m) or greater from any sighted delphinid cetacean. Any vessel underway remain parallel to a sighted delphinid

cetacean's course whenever possible, and avoid excessive speed or abrupt changes in direction. Any vessel underway reduces vessel speed to 10 knots or less when pods (including mother/calf pairs) or large assemblages of delphinid cetaceans are observed. Vessels may not adjust course and speed until the delphinid cetaceans have moved beyond 164 ft (50 m) and/or the abeam of the underway vessel;

- All vessels underway will not divert to approach any delphinid cetacean or pinniped. Any vessel underway will avoid excessive speed or abrupt changes in direction to avoid injury to the sighted delphinid cetacean or pinniped; and
- All vessels will maintain a separation distance of 164 ft (50 m) or greater from any sighted pinniped.

Seasonal Operating Restrictions and Requirements

Ørsted will limit to three the number surveys that will operate concurrently from March through June within the identified lease areas (OCS-A 0486, 0487, and 0500) and ECR areas north of the lease areas up to, but not including, coastal and bay waters. Ørsted plans to operate either a single vessel, two vessels concurrently or, for short periods, no more than three survey vessels concurrently in the areas described above during the March-June timeframe when right whale densities are greatest. This practice will help to reduce both the number and intensity of right whale takes.

Between watch shifts members of the monitoring team will consult NOAA Fisheries North Atlantic right whale reporting systems for the presence of North Atlantic right whales throughout survey operations. Survey vessels may transit the SMA located off the coast of Rhode Island (Block Island Sound SMA) and at the entrance to New York Harbor (New York

Bight SMA). The seasonal mandatory speed restriction period for this SMA is November 1 through April 30.

Throughout all survey operations, Ørsted will monitor NOAA Fisheries North Atlantic right whale reporting systems for the establishment of a DMA. If NOAA Fisheries should establish a DMA in the Lease Area under survey, the vessels will abide by speed restrictions in the DMA per the lease condition.

Based on our evaluation of the applicant's planned measures, as well as other measures considered by NMFS, NMFS has determined that the mitigation measures provide the means of effecting the least practicable impact on marine mammals species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Monitoring and Reporting

In order to issue an IHA for an activity, Section 101(a)(5)(D) of the MMPA states that NMFS must set forth, "requirements pertaining to the monitoring and reporting of such taking." The MMPA implementing regulations at 50 CFR 216.104 (a)(13) indicate that requests for authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present in the planned action area. Effective reporting is critical both to compliance as well as ensuring that the most value is obtained from the required monitoring.

Monitoring and reporting requirements prescribed by NMFS should contribute to improved understanding of one or more of the following:

- Occurrence of marine mammal species or stocks in the area in which take is anticipated (*e.g.*, presence, abundance, distribution, density);

- Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of: (1) action or environment (*e.g.*, source characterization, propagation, ambient noise); (2) affected species (*e.g.*, life history, dive patterns); (3) co-occurrence of marine mammal species with the action; or (4) biological or behavioral context of exposure (*e.g.*, age, calving or feeding areas);
- Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors;
- How anticipated responses to stressors impact either: (1) long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks;
- Effects on marine mammal habitat (*e.g.*, marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat); and
- Mitigation and monitoring effectiveness.

Monitoring Measures

Visual monitoring of the established monitoring and exclusion zone(s) for the HRG surveys will be performed by qualified, NMFS-approved PSOs, the resumes of whom will be provided to NMFS for review and approval prior to the start of survey activities. During these observations, the following guidelines shall be followed:

Other than brief alerts to bridge personnel of maritime hazards and the collection of ancillary wildlife data, no additional duties may be assigned to the PSO during his/her visual observation watch. PSOs must be independent observers (*i.e.*, not construction personnel). However, non-independent observers may be approved by NMFS, on a case-by-case basis, for limited, specific duties in support of approved, independent PSOs. On smaller vessels engaged

in shallow water surveys, limited space aboard the vessel may not allow for 2 or more PSOs. In that case, trained non-independent observers may take over if the lead PSOs needs to take a brief break (*e.g.* bathroom). For all HRG survey segments, an observer team comprising a minimum of four NOAA Fisheries-approved PSOs, operating in shifts, will be stationed aboard respective survey vessels. Should the ASV be utilized, at least one PSO will be stationed aboard the mother vessel to monitor the ASV exclusively. PSOs will work in shifts such that no one monitor will work more than 4 consecutive hours without a 2-hour break or longer than 12 hours during any 24-hour period. Any time that an ASV is in operation, PSOs will work in pairs. During daylight hours without ASV operations, a single PSO will be required. PSOs will rotate in shifts of 1 on and 3 off during daylight hours when an ASV is not operating and work in pairs during all nighttime operations.

The PSOs will begin observation of the monitoring and exclusion zones during all HRG survey operations. Observations of the zones will continue throughout the survey activity and/or while equipment operating below 200 kHz are in use. The PSOs will be responsible for visually monitoring and identifying marine mammals approaching or entering the established zones during survey activities. It will be the responsibility of the Lead PSO on duty to communicate the presence of marine mammals as well as to communicate and enforce the action(s) that are necessary to ensure mitigation and monitoring requirements are implemented as appropriate.

PSOs will be equipped with binoculars and will have the ability to estimate distances to marine mammals located in proximity to their respective exclusion zones and monitoring zone using range finders. Reticulated binoculars will also be available to PSOs for use as appropriate based on conditions and visibility to support the siting and monitoring of marine species. Camera equipment capable of recording sightings and verifying species identification will be utilized.

During night operations, night-vision equipment (night-vision goggles with thermal clip-ons) and infrared technology will be used. Position data will be recorded using hand-held or vessel global positioning system (GPS) units for each sighting.

Observations will take place from the highest available vantage point on all the survey vessels. General 360-degree scanning will occur during the monitoring periods, and target scanning by the PSOs will occur when alerted of a marine mammal presence.

For monitoring around the ASV, a dual thermal/HD camera will be installed on the mother vessel, facing forward, angled in a direction so as to provide a field of view ahead of the vessel and around the ASV. One PSO will be assigned to monitor the ASV exclusively at all times during both day and night when in use. During day operations the ASV will be kept in sight of the mother vessel at all times (within 800 m) and the dedicated ASV PSO will have a clear, unobstructed view of the ASV's exclusion and monitoring zones. PSOs will adjust their positions appropriately to ensure adequate coverage of the entire exclusion and monitoring zones around the respective sound sources. While conducting survey operations at night, the dedicated ASV operator will view live video feed from the dual thermal/HD camera mounted on the ASV. . Images from the cameras can be captured for review and to assist in verifying species identification. In addition, night-vision goggles with thermal clip-ons, as mentioned above, and a hand-held spotlight will be provided such that PSOs can focus observations in any direction, around the mother vessel and/or the ASV.

Observers will maintain 360° coverage surrounding the mothership vessel and the ASV when in operation, which will travel ahead and slightly offset to the mothership on the survey line. PSOs will adjust their positions appropriately to ensure adequate coverage of the entire exclusion zone around the mothership and the ASV.

As part of the monitoring program, PSOs will record all sightings beyond the established monitoring and exclusion zones, as far as they can see. Data on all PSO observations will be recorded based on standard PSO collection requirements.

Reporting Measures

Ørsted will provide the following reports as necessary during survey activities:

Notification of Injured or Dead Marine Mammals

In the unanticipated event that the specified HRG and geotechnical activities lead to an unauthorized injury of a marine mammal (Level A harassment) or mortality (*e.g.*, ship-strike, gear interaction, and/or entanglement), Ørsted would immediately cease the specified activities and report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources and the NOAA Greater Atlantic Regional Fisheries Office (GARFO) Stranding Coordinator. The report would include the following information:

- Time, date, and location (latitude/longitude) of the incident;
- Name and type of vessel involved;
- Vessel's speed during and leading up to the incident;
- Description of the incident;
- Status of all sound source use in the 24 hours preceding the incident;
- Water depth;
- Environmental conditions (*e.g.*, wind speed and direction, Beaufort sea state, cloud cover, and visibility);
- Description of all marine mammal observations in the 24 hours preceding the incident;
- Species identification or description of the animal(s) involved;

- Fate of the animal(s); and
- Photographs or video footage of the animal(s) (if equipment is available).

Activities would not resume until NMFS is able to review the circumstances of the event. NMFS would work with Ørsted to minimize reoccurrence of such an event in the future. Ørsted would not resume activities until notified by NMFS.

In the event that Ørsted discovers an injured or dead marine mammal and determines that the cause of the injury or death is unknown and the death is relatively recent (*i.e.*, in less than a moderate state of decomposition), Ørsted would immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources and the GARFO Stranding Coordinator. The report would include the same information identified in the paragraph above. Activities would be allowed to continue while NMFS reviews the circumstances of the incident. NMFS would work with the Applicant to determine if modifications in the activities are appropriate.

In the event that Ørsted discovers an injured or dead marine mammal and determines that the injury or death is not associated with or related to the activities authorized in the IHA (*e.g.*, previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), Ørsted would report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, and the GARFO Stranding Coordinator, within 24 hours of the discovery. Ørsted would provide photographs or video footage (if available) or other documentation of the stranded animal sighting to NMFS. Ørsted can continue its operations in such a case.

Within 90 days after completion of the marine site characterization survey activities, a draft technical report will be provided to NMFS that fully documents the methods and

monitoring protocols, summarizes the data recorded during monitoring, estimates the number of marine mammals that may have been taken during survey activities, and provides an interpretation of the results and effectiveness of all monitoring tasks. Any recommendations made by NMFS must be addressed in the final report prior to acceptance by NMFS.

Negligible Impact Analysis and Determination

NMFS has defined negligible impact as “an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival” (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (*i.e.*, population-level effects). An estimate of the number of takes alone is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be “taken” through harassment, NMFS considers other factors, such as the likely nature of any responses (*e.g.*, intensity, duration), the context of any responses (*e.g.*, critical reproductive time or location, migration), as well as effects on habitat, and the likely effectiveness of the mitigation. We also assess the number, intensity, and context of estimated takes by evaluating this information relative to population status. Consistent with the 1989 preamble for NMFS’s implementing regulations (54 FR 40338; September 29, 1989), the impacts from other past and ongoing anthropogenic activities are incorporated into this analysis via their impacts on the environmental baseline (*e.g.*, as reflected in the regulatory status of the species, population size and growth rate where known, ongoing sources of human-caused mortality, or ambient noise levels).

To avoid repetition, this introductory discussion of our analyses applies to all the species listed in Table 8, given that many of the anticipated effects of this project on different marine

mammal stocks are expected to be relatively similar in nature. Where there are meaningful differences between species or stocks, or groups of species, in anticipated individual responses to activities, impact of expected take on the population due to differences in population status, or impacts on habitat, they are described independently in the analysis below.

As discussed in the “Potential Effects of the Specified Activity on Marine Mammals and Their Habitat” section, PTS, masking, non-auditory physical effects, and vessel strike are not expected to occur.

The majority of impacts to marine mammals are expected to be short-term disruption of behavioral patterns, primarily in the form of avoidance or potential interruption of foraging. Marine mammal feeding behavior is not likely to be significantly impacted. Prey species are mobile, and are broadly distributed throughout the survey area and the footprint of the activity is small; therefore, marine mammals that may be temporarily displaced during survey activities are expected to be able to resume foraging once they have moved away from areas with disturbing levels of underwater noise. Because of the availability of similar habitat and resources in the surrounding area the impacts to marine mammals and the food sources that they utilize are not expected to cause significant or long-term consequences for individual marine mammals or their populations.

Marine mammal habitat may experience limited physical impacts in the form of grab samples taken from the sea floor. This highly localized habitat impact is negligible in relation to the comparatively vast area of surrounding open ocean, and would not be expected to result in any effects to prey availability. The HRG survey equipment itself will not result in physical habitat disturbance. Avoidance of the area around the HRG survey activities by marine mammal

prey species is possible. However, any avoidance by prey species would be expected to be short term and temporary.

ESA-Listed Marine Mammal Species

ESA-listed species for which takes are authorized are right, fin, sei, and sperm whales, and these effects are anticipated to be limited to lower level behavioral effects. NMFS does not anticipate that serious injury or mortality would occur to ESA-listed species, even in the absence of mitigation and no serious injury or mortality is authorized. As discussed in the *Potential Effects* section, non-auditory physical effects and vessel strike are not expected to occur. We expect that most potential takes would be in the form of short-term Level B behavioral harassment in the form of temporary avoidance of the area or decreased foraging (if such activity were occurring), reactions that are considered to be of low severity and with no lasting biological consequences (*e.g.*, Southall *et al.*, 2007). The planned survey is not anticipated to affect the fitness or reproductive success of individual animals. Since impacts to individual survivorship and fecundity are unlikely, the planned survey is not expected to result in population-level effects for any ESA-listed species or alter current population trends of any ESA-listed species.

There is no designated critical habitat for any ESA-listed marine mammals within the survey area.

The status of the North Atlantic right whale population is of heightened concern and, therefore, merits additional analysis. NMFS has rigorously assessed potential impacts to right whales from this survey. We have established a 500-m shutdown zone for right whales which is highly precautionary considering the Level B harassment isopleth for the largest source utilized in the specified activities for this IHA was initially estimated at 178-m for the Applied Acoustics S-Boom Boomer. However, after accounting for beam width the maximum isopleth for this

equipment is actually no greater than 64 m. We determined that the largest omnidirectional Level B harassment isopleth is more accurately estimated at a maximum of 141 m, and will be used on only 20 percent of vessel days. The next largest Level B isopleth is the GeoMarine Geo-Source 800tip which has a Level B harassment isopleth of 86 m. This device will be used for a maximum of 125 days. The remaining 273 days will utilize various HRG devices with Level B harassment isopleths ranging 63 m (Innomar SES-2000 Medium 100 Parametric Sub-Bottom Profiler) to 6 m (EdgeTech 424 sub-bottom profiler). When these smaller isopleths are taken into account the calculated take decreases from 100 to 47. With these smaller zones, monitoring by PSOs is expected to be highly effective. NMFS is also requiring Orsted to limit the number of survey vessels operating concurrently to no more than three in high-density areas (Lease Areas OCS-A 0486, 0487, 0500 and ECR areas to the north up to, but not including, coastal and bay waters) during high-density periods (March-June). This will reduce both the number and intensity of right whale takes. Additionally, the absence of right whale sightings detailed in a recent marine mammal monitoring report from Lease Area OCS-A 0500 and adjacent ECR corridors suggests that right whales are not common. Given these factors, we are confident in our decision to authorize 10 takes by Level B harassment. Due to the length of the survey and continuous night operations, it is conceivable that a limited number of right whales could enter into the Level B harassment zone without being observed. Although such an occurrence is not expected, any potential impacts to right whales would consist of, at most, low-level, short-term behavioral harassment in a limited number of animals and would have a negligible impact on the stock.

Biologically Important Areas (BIA)

The planned survey area includes a fin whale feeding BIA effective between March and October. The fin whale feeding area is sufficiently large (2,933 km²), and the acoustic footprint of the planned survey is sufficiently small that fin whale feeding opportunities would not be reduced appreciably. Any fin whales temporarily displaced from the planned survey area would be expected to have sufficient remaining feeding habitat available to them, and would not be prevented from feeding in other areas within the biologically important feeding habitat. In addition, any displacement of fin whales from the BIA or interruption of foraging bouts would be expected to be temporary in nature. Therefore, we do not expect fin whale feeding to be negatively impacted by the planned survey.

The planned survey area includes a biologically important migratory area for North Atlantic right whales (effective March-April and November-December) that extends from Massachusetts to Florida (LaBrecque, *et al.*, 2015). Off the south coast of Massachusetts and Rhode Island, this biologically important migratory area extends from the coast to beyond the shelf break. The fact that the spatial acoustic footprint of the planned survey is very small relative to the spatial extent of the available migratory habitat means that right whale migration is not expected to be impacted by the planned survey. Required vessel strike avoidance measures will also decrease risk of ship strike during migration. Additionally, only very limited take by Level B harassment of North Atlantic right whales has been authorized as HRG survey operations are required to shut down at 500 m to minimize the potential for behavioral harassment of this species.

Unusual Mortality Events (UME)

A UME is defined under the MMPA as “a stranding that is unexpected; involves a significant die-off of any marine mammal population; and demands immediate response.” UMEs

are ongoing and under investigation for four species relevant to HRG survey area, including humpback whales, North Atlantic right whales, minke whales, and pinnipeds. Specific information for each ongoing UME is provided below.

As noted previously, elevated humpback whale mortalities have occurred along the Atlantic coast from Maine through Florida since January 2016. Of the cases examined, approximately half had evidence of human interaction (ship strike or entanglement). Beginning in January 2017, elevated minke whale strandings have occurred along the Atlantic coast from Maine through South Carolina, with highest numbers in Massachusetts, Maine, and New York. Preliminary findings in several of the whales have shown evidence of human interactions or infectious disease. Elevated North Atlantic right whale mortalities began in June 2017, primarily in Canada. Overall, preliminary findings support human interactions, specifically vessel strikes or rope entanglements, as the cause of death for the majority of the right whales. Elevated numbers of harbor seal and gray seal mortalities were first observed in July, 2018 and have occurred across Maine, New Hampshire and Massachusetts. Based on tests conducted so far, the main pathogen found in the seals is phocine distemper virus although additional testing to identify other factors that may be involved in this UME are underway.

Direct physical interactions (ship strikes and entanglements) appear to be responsible for many of the UME humpback and right whale mortalities recorded. The planned HRG survey will require ship strike avoidance measures which would minimize the risk of ship strikes while fishing gear and in-water lines will not be employed as part of the survey. Furthermore, the planned activities are not expected to promote the transmission of infectious disease among marine mammals. The survey is not expected to result in the deaths of any marine mammals or combine with the effects of the ongoing UMEs to result in any additional impacts not analyzed

here. Accordingly, Ørsted did not request, and NMFS is not proposing to authorize, take of marine mammals by serious injury, or mortality.

The required mitigation measures are expected to reduce the number and/or severity of takes by giving animals the opportunity to move away from the sound source before HRG survey equipment reaches full energy and preventing animals from being exposed to sound levels that have the potential to cause injury (Level A harassment) and more severe Level B harassment during HRG survey activities, even in the biologically important areas described above. No Level A harassment is anticipated or authorized.

NMFS expects that most takes would primarily be in the form of short-term Level B behavioral harassment in the form of brief startling reaction and/or temporary vacating of the area, or decreased foraging (if such activity were occurring)—reactions that (at the scale and intensity anticipated here) are considered to be of low severity and with no lasting biological consequences. Since both the source and the marine mammals are mobile, only a smaller area would be ensonified by sound levels that could result in take for only a short period.

Additionally, required mitigation measures would reduce exposure to sound that could result in more severe behavioral harassment.

In summary and as described above, the following factors primarily support our determination that the impacts resulting from this activity are not expected to adversely affect the species or stock through effects on annual rates of recruitment or survival:

- No mortality or serious injury is anticipated or authorized;
- No Level A harassment (PTS) is anticipated;
- Any foraging interruptions are expected to be short term and unlikely to be cause significantly impacts;

- Impacts on marine mammal habitat and species that serve as prey species for marine mammals are expected to be minimal and the alternate areas of similar habitat value for marine mammals are readily available;
- Take is anticipated to be primarily Level B behavioral harassment consisting of brief startling reactions and/or temporary avoidance of the survey area;
- Survey activities would occur in such a comparatively small portion of the biologically important area for north Atlantic right whale migration, that any avoidance of the survey area due to activities would not affect migration. In addition, mitigation measures to shut down at 500 m to minimize potential for Level B behavioral harassment would limit take of the species, resulting in a conservative estimate of 10 takes, in the form of 10 short-term exposures, which would not be expected to affect the reproduction or survival of any individuals, much less the stock. Similarly, due to the small footprint of the survey activities in relation to the size of a biologically important area for fin whales foraging, the survey activities would not affect foraging behavior of this species; and
- Planned mitigation measures, including visual monitoring and shutdowns, are expected to minimize the intensity of potential impacts to marine mammals.

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the required monitoring and mitigation measures, NMFS finds that the total marine mammal take from Ørsted's planned HRG survey activities will have a negligible impact on the affected marine mammal species or stocks.

Small Numbers

As noted above, only small numbers of incidental take may be authorized under section 101(a)(5)(D) of the MMPA for specified activities other than military readiness activities. The MMPA does not define small numbers and so, in practice, where estimated numbers are available, NMFS compares the number of individuals taken to the most appropriate estimation of abundance of the relevant species or stock in our determination of whether an authorization is limited to small numbers of marine mammals. Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities.

The numbers of marine mammals that we propose for authorization to be taken, for all species and stocks, would be considered small relative to the relevant stocks or populations (less than 17 percent for all authorized species).

Based on the analysis contained herein of the planned activity (including the required mitigation and monitoring measures) and the anticipated take of marine mammals, NMFS finds that small numbers of marine mammals will be taken relative to the population size of the affected species or stocks.

Impact on Availability of Affected Species for Taking for Subsistence Uses

There are no relevant subsistence uses of marine mammals implicated by this action. Therefore, NMFS has determined that the total taking of affected species or stocks would not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence purposes.

National Environmental Policy Act

To comply with the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq.*) and NOAA Administrative Order (NAO) 216-6A, NMFS must review our action (*i.e.*, the issuance of an incidental harassment authorization) with respect to potential impacts on the

human environment. Accordingly, NMFS prepared an EA and analyzed the potential impacts to marine mammals that would result from the project. A FONSI was signed in May 2019. A copy of the EA and FONSI is available at: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-other-energy-activities-renewable>.

Endangered Species Act

Section 7(a)(2) of the Endangered Species Act of 1973 (ESA: 16 U.S.C. 1531 *et seq.*) requires that each Federal agency insure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. To ensure ESA compliance for the issuance of IHAs, NMFS consults internally, in this case with the Greater Atlantic Regional Field Office (GARFO), whenever we propose to authorize take for endangered or threatened species.

The NMFS Office of Protected Resources is authorizing the incidental take fin, sei, sperm, and North Atlantic right whales which are listed under the ESA. Under section 7 of the ESA, BOEM consulted with NMFS GARFO on commercial wind lease issuance and site assessment activities on the Atlantic Outer Continental Shelf in Massachusetts, Rhode Island, New York and New Jersey Wind Energy Areas. NMFS GARFO issued a Biological Opinion concluding that these activities may adversely affect but are not likely to jeopardize the continued existence of fin, sei, sperm, and North Atlantic right whales. Upon request from the NMFS Office of Protected Resources, the NMFS GARFO will issue an amended incidental take statement associated with this Biological Opinion to include the takes of the ESA-listed whale species authorized through this IHA.

Authorization

NMFS has issued an IHA to Ørsted for HRG survey activities effective one year from the date of issuance, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated.

Dated: September 26, 2019.

Catherine Marzin,

Deputy Director, Office of Protected Resources,

National Marine Fisheries Service.

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